Nov. 1, 1960 S. HENIG 2,958,261

PREDETERMINED TARGET DISPERSAL ROCKET LAUNCHER

Filed May 12, 1953 5 Sheets-Sheet 1

FIG. 1

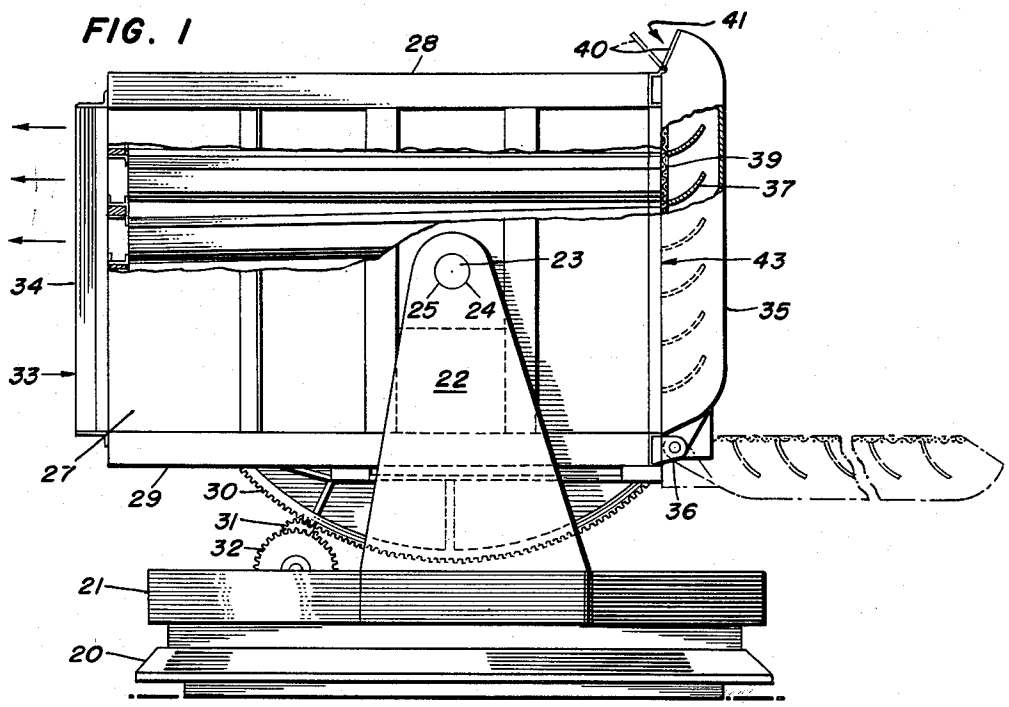
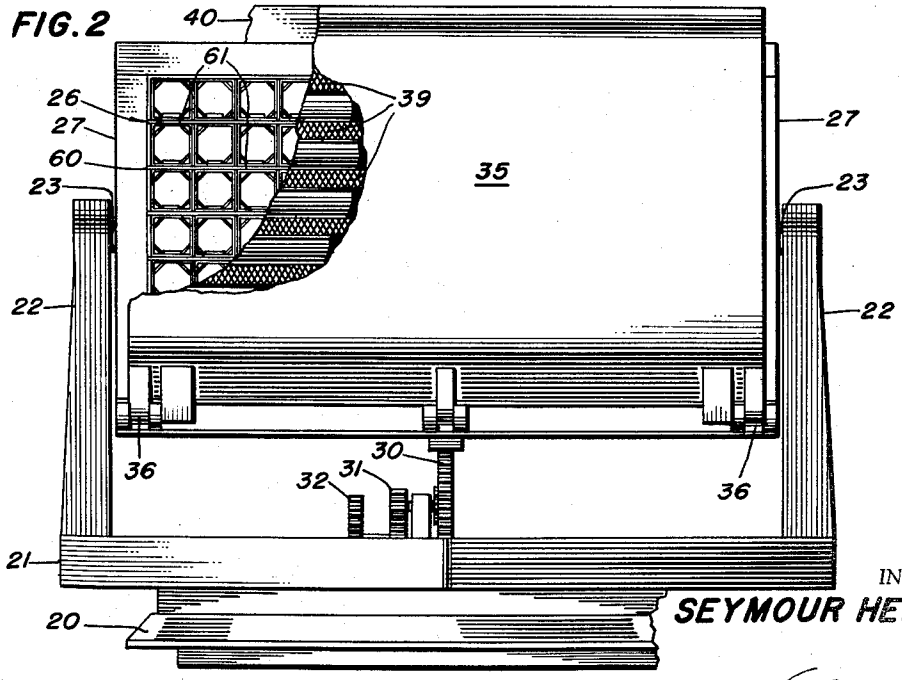


FIG. 2



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Nov. 1, 1960 S. HENIG 2,958,261

PREDETERMINED TARGET DISPERSAL ROCKET LAUNCHER

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FIG. 3

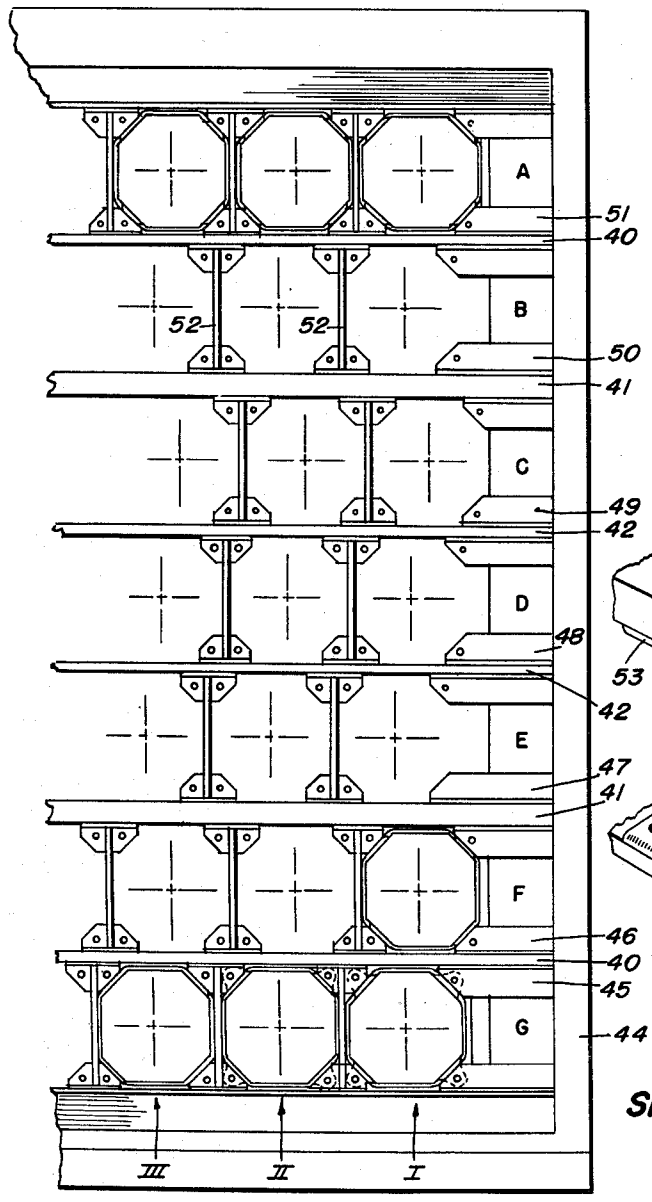


FIG. 14

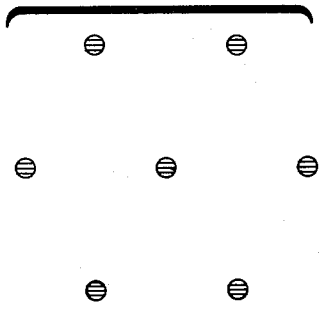
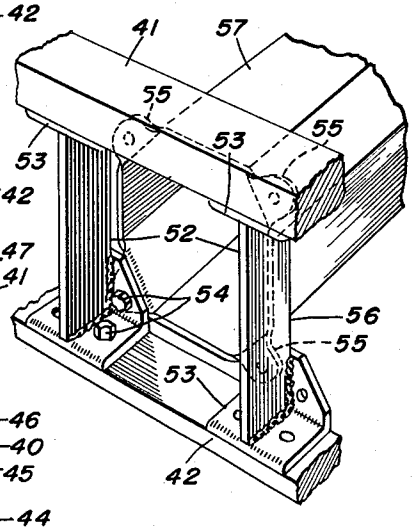


FIG. 4



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PREDETERMINED TARGET DISPERSAL ROCKET LAUNCHER

Filed May 12, 1953 5 Sheets-Sheet 3

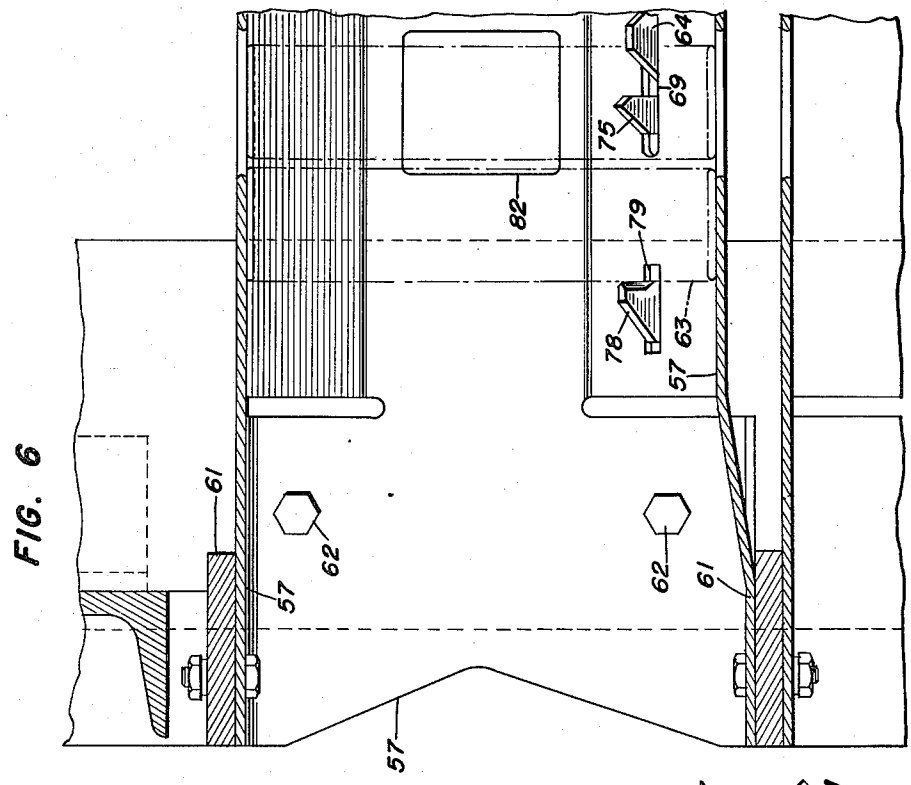

FIG. 6

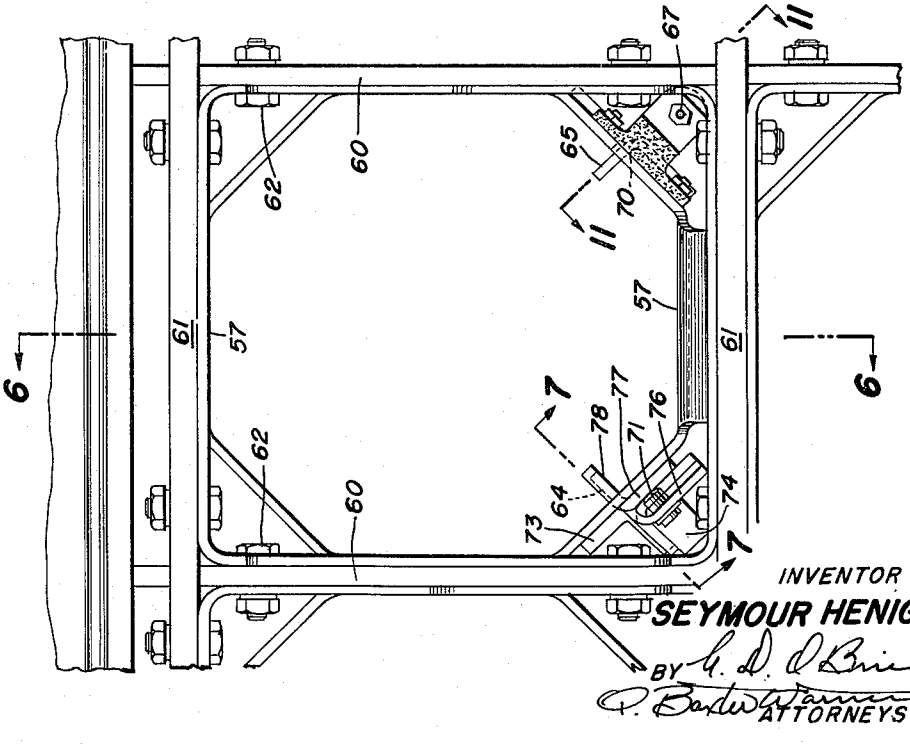

FIG. 5

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PREDETERMINED TARGET DISPERSAL ROCKET LAUNCHER

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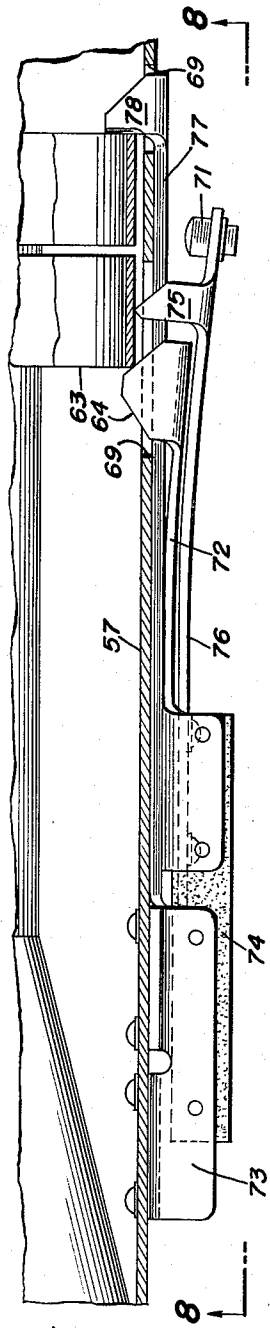

FIG. 7

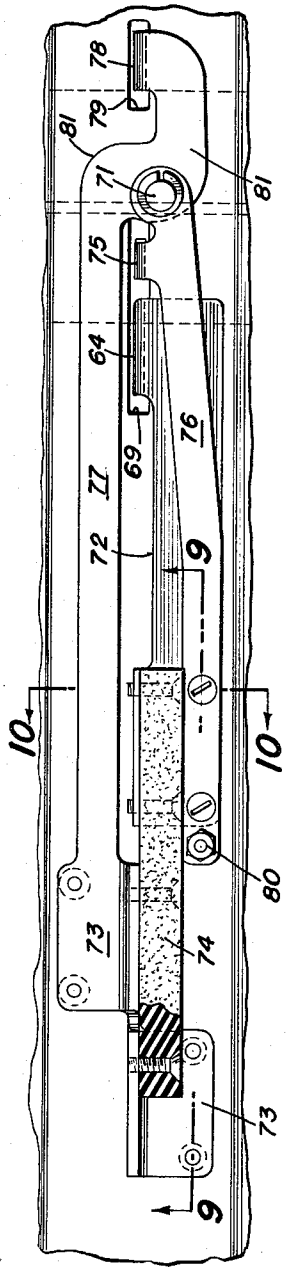

FIG. 8

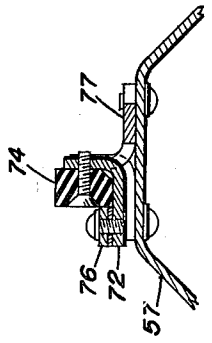

FIG. 10

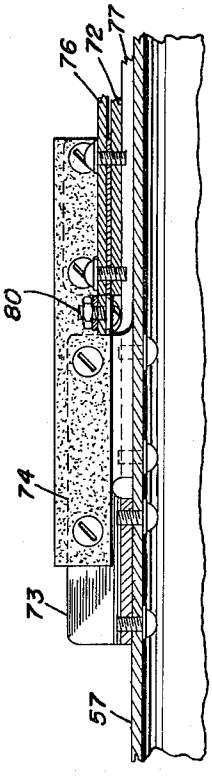

FIG. 9

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PREDETERMINED TARGET DISPERSAL ROCKET LAUNCHER

Filed May 12, 1953 5 Sheets-Sheet 5

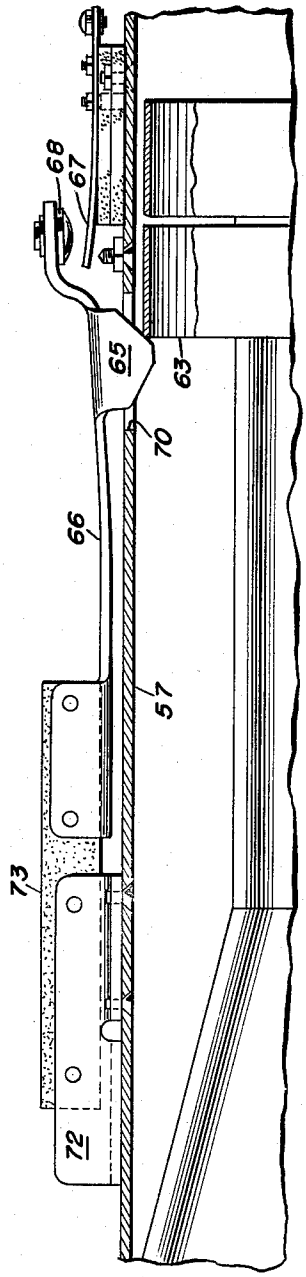

FIG. 11

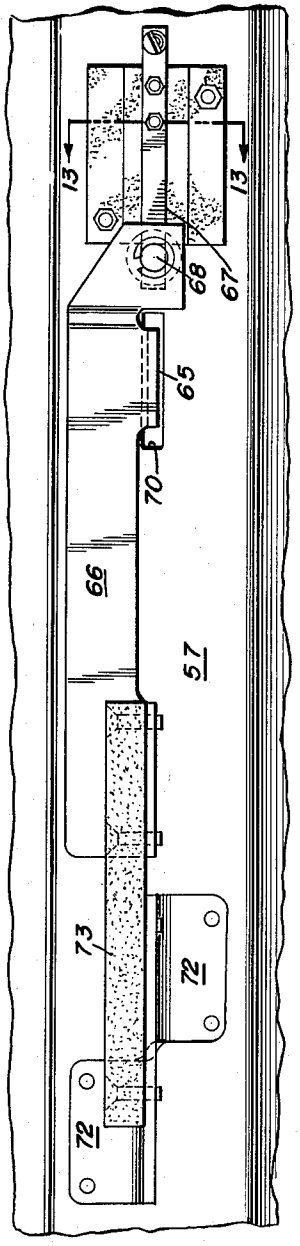

FIG. 12

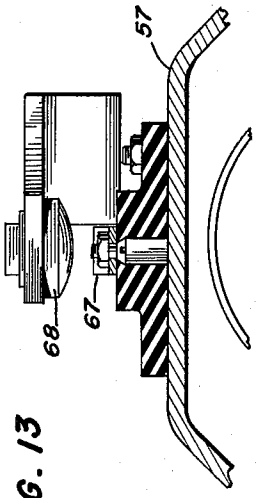

FIG. 13

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Patented Nov. 1, 1960

2,958,261

PREDETERMINED TARGET DISPERSAL ROCKET LAUNCHER

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Filed May 12, 1953, Ser. No. 354,661

1 Claim. (Cl. 89—1.7)

(Granted under Title 35, U.S. Code (1952), sec. 266)

This invention pertains to a multiple tube rocket projectile launching apparatus and in particular to a rocket launcher which electrically fires a plurality of rockets within a salvo wherein each round of the salvo conforms to a predetermined selected position within a target pattern.

The devices of the prior art for launching modern rockets attempt to achieve a resultant target dispersal plan by firing individual rocket projectiles either at a fixed range or at a variable range. The resultant dispersal is erratic and the effectiveness of target coverage achieved by simultaneous detonation is lost in either system. Conventional training and elevating mechanisms used on other ordnance applications have been modified and incorporated for use with these single rocket discharge launchers. Barrage or battery type units have also been utilized with an attempt to achieve optimum target area dispersal by launching a series of rockets in rapid fire order relying on the inherent differences in flight trajectory characteristics to yield an effective target plan. It is readily apparent that the overlap and dispersion areas become subjects of chance and not design.

Various firing means have also been devised to discharge electrically individual rockets from a launcher. Loading military rockets in rapid order into the launcher discharge tubes results in constant wear on the electrical firing contacts and constant replacement is necessary to assure positive electrical contact upon actuation of the firing key. However, it is evident that prior to detection of the objectable wear malfunctioning due to faulty contact will occur unless the electrical contacts make satisfactory electrical contact with the rocket to be launched.

The present invention has for an object the provision of a multiple rocket launcher from which a selected number of salvos may be fired at variable range, in rapid succession, without reloading, each salvo comprising a preselected number of rockets which will cover a prearranged pattern at the target with optimum overlap and dispersion.

Another object of the invention is the instantaneous launching of a multiple rocket salvo which has been preconditioned to yield a resultant target dispersion in accordance with a predetermined plan.

Another object of this invention is to fire a salvo of multiple rockets according to a planned dispersal at various ranges.

A further object of this invention is to provide a waterproof launching rack assembly, loadable from a fore as well as an aft position, with a novel protected electrical contact firing element mounted to cooperate within each launching tube.

Another object of this invention is to incorporate a fixed target pattern plan within the launcher framework which will orient the replaceable rocket tubes to the desired angularity thereby producing the desired target pattern.

In carrying the invention into effect, as illustrated by the particular embodiment herein described, an enclosed framework of individual supporting spaced structural elements form a grid system to accommodate replaceable rocket tubes which constitute series of multiple rocket salvos that are selectively disposed to produce a predetermined target fire pattern when a salvo of rockets is simultaneously discharged. The target pattern produced by the discharged salvo yields optimum overlap and dispersion areas. Individual electrical contacts within each rocket tube are electrically interconnected to the other rockets within the remaining chambers of the series constituting the salvo.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a side elevational view, with a portion broken away of one embodiment of the present invention;

Fig. 2 is a rear elevational view, with a portion broken away of the embodiment illustrated in Fig. 1;

Fig. 3 is an enlarged front view of a portion of the launcher of Figs. 1 and 2 illustrating one way in which the rocket tubes may be disposed;

Fig. 4 is a perspective view of the front structural assembly of a single rocket tube;

Fig. 5 is an enlarged view of the rear end of a single launcher tube illustrating the relative positions of the electrical contacts and rocket detents;

Fig. 6 is a horizontal section taken along the line 6—6 of Fig. 5 and illustrating the rocket firing electrical contact and the rocket detents;

Fig. 7 is a longitudinal section along the line 7—7 of Fig. 5 illustrating forward and rear detents and the electrical contact in cooperative engagement with a rocket;

Fig. 8 is a similar view taken along the line 8—8 of Fig. 7;

Fig. 9 is a side view, partially in section, along line 9—9 of Fig. 8 illustrating the insulating support for the electrical contact;

Fig. 10 is a transverse sectional view along line 10—10 of Fig. 8 illustrating the mode of anchoring detents and electrical insulator;

Fig. 11 is a section along the line 11—11 of Fig. 5 illustrating the forward detent and the guide loaded switch;

Fig. 12 is a top plan view of the forward detent and guide loaded switch of Fig. 11;

Fig. 13 is an enlarged transverse sectional view along line 13—13 of Fig. 12 of the guide loaded switch; and

Fig. 14 illustrates a desired fire target pattern attained by a seven charge salvo from an apparatus of the character described herein.

As shown in the embodiment illustrated the multiple rocket launcher and mount may comprise a bedplate 20 anchored to a ship's deck or other suitable surface and supporting a revolvable training platform 21. The training platform may be rotated by any conventional driving means located within the inner periphery of the platform. The bedplate 20 and platform 21 may be weldments providing the requisite rigidity to the assembled launcher under sea loads, firing loads, and dynamic loads. Suitable access is provided internally of the base plate 20 and pedestal ring 21 for a control column which houses the power and control cables serving to protect them against the outside elements. Remote control may be provided to a central fire control station through electrical cables mounted within the housing.

Vertically mounted on the training platform ring 21 is a pair of trunnion supports 22, 22 diametrically opposite each other which support trunnion shafts 23, 23 within the bearings 24, 24 recessed within apertures 25 drilled in the upright trunnion supports 22, 22. A reticulated grid framework system 26 partially enclosed at the top and sides for receiving individual rocket tubes 57 is swingably mounted on the trunnion shafts 23, 23 secured to the closed sides of the frame 27, 27 and supported within the bearings 24, 24 mounted within the trunnion supports 22, 22. The rectangular framework or rack 26 of the launcher proper is enclosed on the top and bottom surfaces 28, 29 respectively by an impervious plate, preferably steel. Side plates 27, 27 of a similar material enclose the framework parallel to the upright trunnion supports 22, 22. Securely fastened to the bottom surface 29 of the framework is a sector elevating rack 30 which cooperates with an elevating gear driven by pinion 31 from the gear train 32 housed within the training ring 21 to elevate or depress the launcher framework 26 through the desired angle.

The front or discharge side 33 of the launcher when not in a loading or firing position is normally closed by suitable doors 34 vertically hinged to the front end of side plates 27, 27. Watertight sealing gaskets suitably mounted on the front doors 34, 34 and rear gas chamber gas deflector door 35 protect the internal mechanism of the launcher and mounted rockets from the harmful effects of climatic changes and water seepage or spray.

Pivotally connected by a horizontally mounted hinge 36 on the bottom surface of the framework 29 is a rear chamber gas deflector door and platform 35 in which a group of arcuate vanes 37 deflect rocket gases upwardly when the gas chamber door 35 is elevated from the horizontal loading position to the vertical firing position, as shown in Fig. 1. A reticulated mesh platform 39 mounted on the chamber door 35 provides supporting structure for spaced gas deflector vanes 37 within the chamber door 35. The arcuate gas deflector vanes 37, horizontally secured to the chamber door 35, divert gases upwardly when the chamber door is in the vertical firing position ready to receive the spent rocket gases. During the loading period the gas deflector chamber door 35, shown in dotted lines in Fig. 1, is in a horizontal position and may be used as a support on mesh platform 39 for a crew to load the rockets from the aft launcher position. Horizontally hinged to the top plate 28 of the launcher framework is a gas escape port door 40 which cooperates with the gas chamber deflector door 35 to permit gases to escape by passing through the gas deflector door 35 through the opening provided by the open gas escape port 41 during the firing cycle.

An optimum fire pattern to be achieved in firing a salvo of seven rockets is that shown in Fig. 14 wherein a hexagonal configuration represents the desired dispersion of rounds about a central round resulting in a complete target coverage and overlap. Variations from the hexagonal pattern shown may be obtained by varying the spacing of the launcher tubes within the grid system 26 of the framework, to be described hereinafter, by slightly different angularization imposed upon each of the respective launcher tubes within the grid framework. In the embodiment illustrated in Figs. 1 and 2 there are 14 salvos spaced laterally within the grid system 26 and each salvo comprises a series of seven individual rocket rounds disposed above each other in tiers. The systematic disposition for spacing the individual rocket tubes constituting a salvo will be described hereinafter. Since the fore or rocket discharge side and the aft or gas receiving section 43 of the launcher differ radically each section shall be considered separately.

The rocket discharge side of the launcher illustrated in Fig. 3 shows the relative positioning of a salvo I of seven rocket tubes disposed within tier intervals A to G inclusive selectively spaced vertically within the framework and with respect to adjacent salvos II and III. Horizontal cross straps 40, 41, and 42 are so selected and spaced as to form vertical tiers having the desired predetermined vertical intervals.

The lateral disposition of the individual rocket tube spaces of each seven charge salvo as shown in Fig. 3 for salvos I, II and III produces the desired target dispersion configuration illustrated in Fig. 14. Upon selection of the desired target pattern, pairs of side spacer bars 45, 46, 47, 48, 49, 50, and 51 dimensioned in accordance with the pattern, are rigidly mounted, as by welding, within the selected tier position in opposed parallel relation. For example, a side spacer bar 50 is secured to the lower side of cross strap 40 and the other spacer bar 50 within the same tier is secured to the upper side of cross strap 41, the end of each spacer bar 50 is laterally based on vertical post 44.

Launcher tube angle support brackets 53, 53 are welded to vertical spacer support bars 52 to form rigid I-frame members 56. By laterally spacing vertical I-members 56 individual rectangular supporting frames are formed. Each I-member 56 is fastened to the horizontal cross straps as by bolts 54 through one leg of the angle bracket 53. The other leg of the bracket 53 is drilled to receive fastening means which will secure the individual launcher tube lugs or projections 55 when the tube is mounted within the grid framework 26 and aligned within the rectangular openings formed by the I-frame members 56 and the cross straps.

Each guide tube 57 of the salvo I which constitutes seven rounds of rockets is elevated to a predetermined angle by the cross straps, and in addition each launcher tube 57 is trained at a slightly different angle. Therefore, the tubes are staggered or laterally spaced from a vertical line passing through the center of the central rocket tube 57 located in tier D of the salvo I in accordance with the desired target dispersion plan as shown in Fig. 14. Identical vertical I-member separators 56 are inserted between adjacent salvos I, II, III, etc. to continue the fire pattern exhibited by the salvo I.

The rocket loading side or aft side of the launcher 43 is illustrated in a loading position in Fig. 1 by the lowered gas chamber door and platform 35. An open rear section of the launcher presents a more uniform grid system pattern, as shown in Fig. 2, in that equal horizontal cross strap members 60 and uniform vertical spacer members 61 form uniform squares in vertical alignment throughout the framework 26.

Individual rocket launcher tubes 57 are inserted into the reticulated grid system 26 from the aft position 43 and made secure by fastening to the front I-members 56 at the brackets 53. Each longitudinal rocket tube is provided with mounting lugs or projections 55 at the front end of the tube to engage with projecting gussets on angle bracket 53 fastened to the I-frame separators 56 as shown in Fig. 4. Holes drilled in each of the gussets of brackets 53 and each of the lugs 55 are aligned and secured by a nut and bolt thereby facilitating replacement of a single launcher tube whenever necessary.

The rearmost portion of the aft section of each tube 57 is expanded from the original of octagonal configuration into a rectangular form in order to provide a securing surface for the sides of the tube contiguous with the cross straps 60 and vertical separators 61. Bolts 62 pass through holes in the rocket tube 57 to cooperate with those in the vertical separators 61 and the cross straps 60 securing the tube 56 within the grid system 26. The enlarged rectangular aft section of the tube 57 does not obstruct the shroud 63 on the rocket when the rocket is positioned within the tube preparatory to launching.

Mounted on the framework of each rocket tube 57 and laterally contacting the rocket shroud 63 is a pair of spring urged cam shaped forward detents 64, 65 yieldably retaining the rocket from forward longitudinal movement. Forward detent arm 66 is offset and prolonged

beyond forward detent 65 to provide a terminal contact 68 which will electrically engage a guide switch 67 mounted on the tube 57 but insulated therefrom. Extending parallel to the axis of the launcher tube 57, the spring urged cam shaped forward detents 64, 65 are shown in Fig. 5 fastened on two of the octagonal sides of the launcher tube 57 and located within the rectangular cavities formed by the sides of adjacent octagonal launcher tubes. The forward detents 64, 65 are resiliently held in cooperative engagement with the rocket shroud 63 through elongated apertures 69, 70 in the launcher tube 57.

A forward detent supporting arm 66 integral with the forward detent 65 is mounted on the bracket 72 to an octagonal side of the launcher tube 57 through insulating strip 73. The forward detent supporting arm 66 is essentially a flat lever spring on which the detent 65 is formed. The spring supporting arm 66 is prolongated and offset to form the guide switch contact point 68 which cooperates with a guide loaded switch 67 secured to the tube 57 and is in alignment with the forward detent supporting arm 66.

The guide loaded switch 67, mounted on the tube 57 and insulated therefrom, and the guide switch contact point 68 may be made to cooperate electrically either in the open or closed position so that a remote panel board with signal indicators corresponding to each tube will designate whether the rocket is within the tube or has been discharged therefrom.

Spring loaded forward detent 64 within the rectangular cavity formed by adjacent launcher tubes is supported by the forward detent supporting arm 72 and is mounted in a manner substantially similar to the forward detent 65 to engage another point on the leading edge of the rocket shroud 63. Forward detent supporting arm 72 spaced laterally from the launcher tube 57 is connected to but electrically insulated from the securing bracket 73 mounted on the launcher tube 57 by insulating block 74. Laterally spaced from the forward detent 64 and arm 72 on the bracket 73 is the spring loaded electrical firing contact 75 which projects from the firing contact spring arm 76 and is intermediate the ends of the arm. The firing contact 75 protrudes through an elongated aperture 69 in the launcher tube 57 to contact electrically the rocket shroud 63. Fastened to the free end of the firing contact spring arm 76 is an insulator 71 to be described later. Terminal post 80 on the firing contact arm will accommodate the lead wire to complete the electrical circuit to the launcher tube 57.

A spring lever aft bottoming latch arm 77 contiguous with the wall of the tube 57 is retained in position on the bracket 73, but offset from the forward detent arm 72. Integral with the latch arm 77 is a cam shaped aft latch 78 located at the free end of the arm 77 which protrudes through an elongated aperture 79 in the rocket tube 57 to secure the trailing edge of the rearmost shroud 63 on the rocket confining it from rearward longitudinal displacement within the tube 57. Rectangular cutouts 82 at the top, bottom and sides at the aft section of each tube 57 adjacent the shroud ring location in the tube isolate the ring from ground contact.

The rocket loading operation, both fore and aft, will describe more fully the function and cooperation of the forward detents 64, 65, the firing contact 75, and the insulator 71.

Aft loading of the launcher requires that the rear chamber gas deflector door 35 be lowered into the horizontal position in order to provide a standing platform 39 for the loading personnel and also to afford access to the grid system of nested tubes 26. The rockets are placed ogive or forward end first into the tube 57 and then slidably moved forward. The main body of the rocket and then the leading edge of the forward shroud 63 contact the inclined rearmost cam surface of the aft latch 78 displacing the latch and spring latch arm 78 laterally thereby permitting the rocket to advance further within the tube 57. Lateral displacement of the spring latch arm 77, as shown in Fig. 8, is offset at 81 to contact the insulator button 71 thereby shifting the firing arm contact 75 and arm 76 away from the oncoming rocket shroud 63 protecting the firing contact against wear and mutilation. The aft latch arm 77 will shift the firing contact laterally so long as any part of the rocket body or shroud 63 touches the aft latch 78 before the rocket is seated into position within the launching tube. As the rearmost vertical portion of the trailing edge of the shroud 63 engages the forward vertical edge of the aft latch 78 the rocket becomes anchored in the tube 57 and the aft latch arm will be urged against the tube wall permitting the firing contact 75 to pass through the elongated aperture 69 thereby making electrical contact with the rocket shroud 63. The rocket placed within the tube 57 is constantly urged rearward against the vertical section of the aft latch 78, assuring continuous engagement of the firing contact 75, by the cam shaped spring loaded forward detents 64, 65 which are displaced laterally sufficiently to urge the leading edge of the shroud 63 backward forcing the trailing edge of the shroud against the aft latch 78. The spring loaded forward detent 65 which initially permitted electrical contact between the prolongated arm 68 and the guide loaded switch 67 before the rocket was seated becomes disengaged as the rocket is positioned within the rocket tube 57 thereby indicating on a remote signal panel board (not shown) that the tube 57 is made ready for firing.

Upon completion of the loading operation the rear gas chamber door 35 is raised into the firing position to deflect the rocket exhaust gases, as shown in Fig. 1.

Forward loading may be accomplished while the rear gas chamber door 35 is raised in the firing position by placing the tail or shroud end of the rocket into the tube 57 first and then slidably moving the rocket into the tube. The trailing edge of the rearmost shroud 63 deflects the inclined cam surface of the spring loaded forward detents 64, 65 laterally to permit the rocket to advance further toward the seated position against the vertical portion of the spring loaded aft latch 78. Lateral deflection of the forward detent 64 depresses or shifts the firing contact arm 76 and contact 75 out of the shroud path. The guide loaded switch 67 is opened as previously described for the rear loading operation as the forward detent 65 is displaced laterally. Advancing the rocket to seat against the aft latch 78 permits the forward detents 64, 65 to engage the leading edge of the front shroud 63 thereby urging the rocket against the vertical base of the aft latch 78 permitting the firing contact 75 to engage electrically the rocket shroud 63. The firing contact 75 is protected during a rocket discharge by the forward detent 64 which will deflect laterally the firing contact arm 76.

The train and elevating drives used may be the conventional 40 mm. mount train power drive comprising a train drive motor, train synchro assembly, train power off-brake assembly, train motor amplidyne set, train control unit, train amplified unit and train starting reactor unit (not shown in the drawings).

Safety provisions may be incorporated within the operating mechanism in the form of electrical interlocks mounted on the front doors to prevent firing if any door is not fully open, in addition, an electrical interlock is preferably placed at the rear chamber gas deflector which prevents rocket launching unless the rear gas deflector door is in the closed position. Additional electrical interlocks or positive stops may be provided to blank out certain areas not within the possible field of fire both in a horizontal and vertical plane. An additional safety precaution is provided which will detect rocket misfires when the rocket will remain within the launcher tube after the other rockets in the salvo have been fired and launched by simply checking the panel

board for the guide loaded switches which are electrically connected to each rocket tube. The action of a guide loaded switch is such that whenever a tube is empty the corresponding switch is closed thereby indicating on a remote panel board that the rocket has been discharged. Conversely when a rocket is in firing position in the tube the guide switch will be open and relate the condition of the tube on the panel board to the operating personnel.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claim the invention may be practiced otherwise than as specifically described.

What is claimed is:

In a rocket launcher, loadable from a fore and aft position, to fire a plurality of salvos wherein each round is guided in trajectory in accordance with a predetermined pattern incorporated within the launcher comprising; a base traversable in a horizontal plane, trunnion supports spaced on said base, a sector rack, a frame open for and aft to load rockets, said frame oscillatable in a vertical plane through said trunnion supports and rack, doors vertically hinged to enclose the fore end of the frame, a rear gas chamber door horizontally hinged at the base of said frame, arcuate vanes on said chamber door to deflect rocket gases, a top gas discharge door horizontally hinged on said frame to cooperate with said chamber door to emit gases deflected by the vanes, gaskets on all doors engaging the frame to provide a watertight seal for the enclosed frame, a grid system for individual launching tubes nested within the frame comprising a series of laterally spaced salvos, individual tubes within a salvo are spaced vertically and laterally in accordance with a predetermined target pattern, separate retaining means and a firing contact in each tube, said retaining means comprising spring loaded forward detents and an aft latch, said forward detents respectively having forwardly inclined and rearwardly inclined cam surfaces and laterally displaceable in response to engagement with a muzzle loaded rocket and spaced from said aft latch to retain the rocket within predetermined limits within the rocket tubes, said aft latch having a vertical forward surface and a rearwardly inclined cam surface for enabling the aft latch to be displaced in response to engagement with a breech loaded rocket, said firing contact comprising a spring arm, a firing contact, displaceable out of the path of a rocket being loaded, and an insulator on said arm, said aft latch and said forward detents being so positioned relative to the firing contact spring arm to engage and shift the spring arm and firing contact theeron away from a rocket being loaded in response to lateral displacement of the aft latch or the detents in breech loading and muzzle loading, respectively, said firing contact electrically engaging the properly positioned loaded rocket disposed between and in engagement with said forward detents and aft latch thereby completing a circuit which upon electrical energization will discharge the rocket from the tube.

References Cited in the file of this patent

UNITED STATES PATENTS

2,430,636	Gould	Nov. 11, 1947
2,448,962	D'Ardenne	Sept. 7, 1948
2,460,929	Goff	Feb. 8, 1949
2,481,910	D'Ardenne	Sept. 13, 1949

FOREIGN PATENTS

832,464	France	July 4, 1938
914,341	France	June 17, 1946
970,202	France	June 14, 1950
272,168	Switzerland	Feb. 16, 1951