

[54] TOY TANK

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[51] Int. Cl. **A63h 17/04**

[58] Field of Search **46/219, 244 R; 124/11, 124/29**

[56] **References Cited**

UNITED STATES PATENTS

2,279,386	4/1942	Carver	46/219
2,551,109	5/1951	Fornary	46/219
3,065,569	11/1962	Nielsen et al.	46/219
3,774,586	11/1973	Siato	46/219

Primary Examiner—Louis G. Mancene

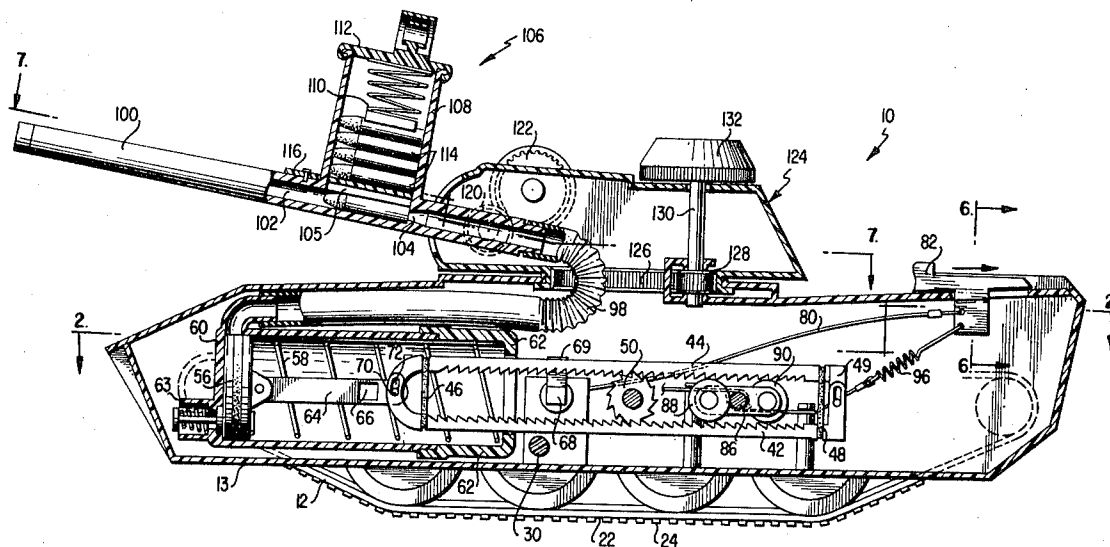
Assistant Examiner—Robert F. Cutting

[57]

ABSTRACT

A toy tank is disclosed which is intended as a source of recreation for children. The tank consists of a body mounted upon a moveable chassis having a plurality of wheels secured thereto for allowing forward and reverse motion. A pair of ratchet mechanisms convert the rotary motion of the wheels into linear motion which is used for cocking a projectile firing mechanism. A sear is provided for detaining the projectile firing mechanism in the cocked position. The projectile firing mechanism includes a spring-loaded air piston disposed inside of a piston housing. The spring is compressed when the projectile firing mechanism is cocked. A trigger mechanism, which is mechanically coupled to the sear, permits the selective activation of the projectile firing mechanism by the tank's operator. Pulling of the trigger mechanism releases the spring-loaded air piston which produces a blast of air that forces a projectile from the firing mechanism. Each tank is provided with a plurality of targets which disintegrate when hit by a projectile.

10 Claims, 14 Drawing Figures



SHEET 1 OF 7

FIG. 1

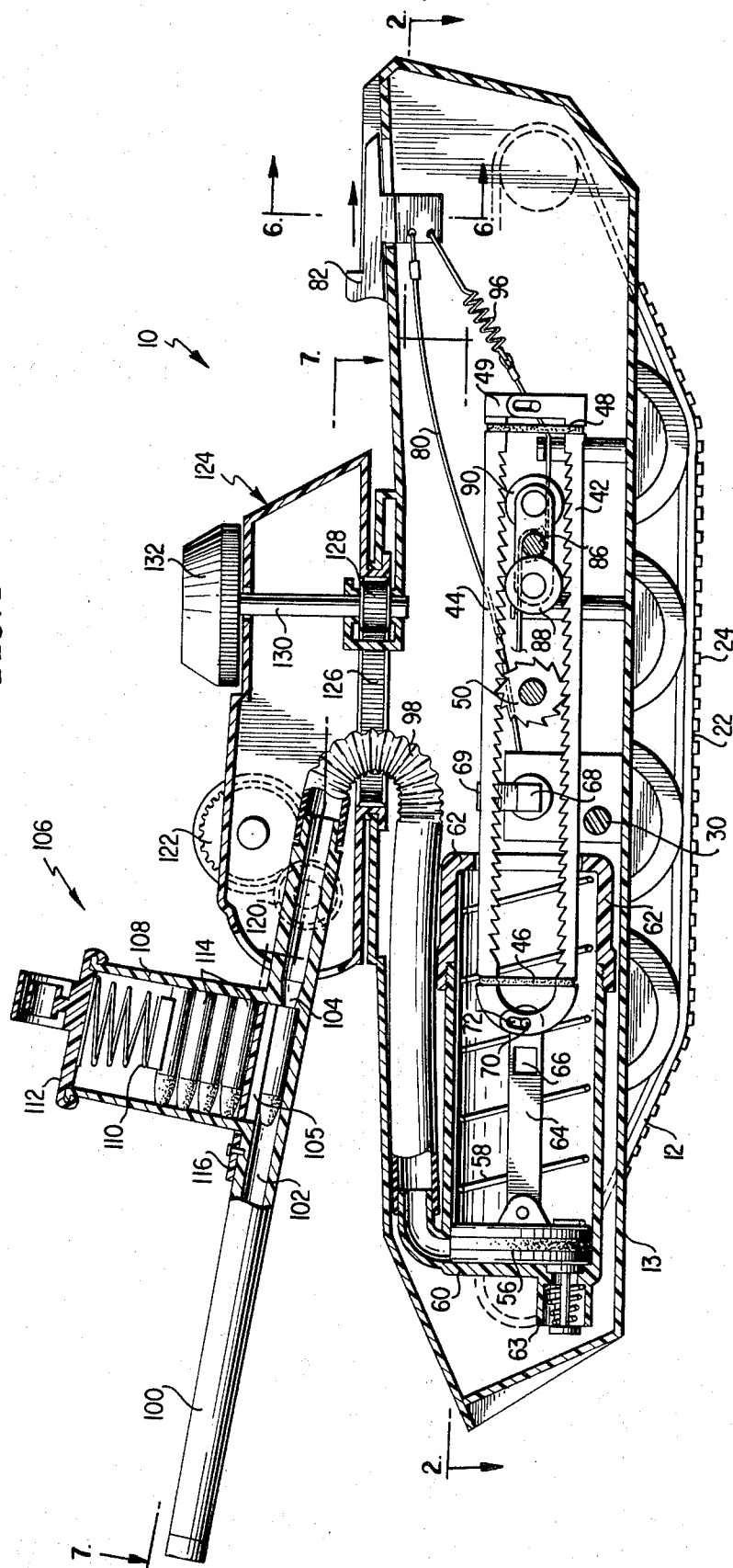
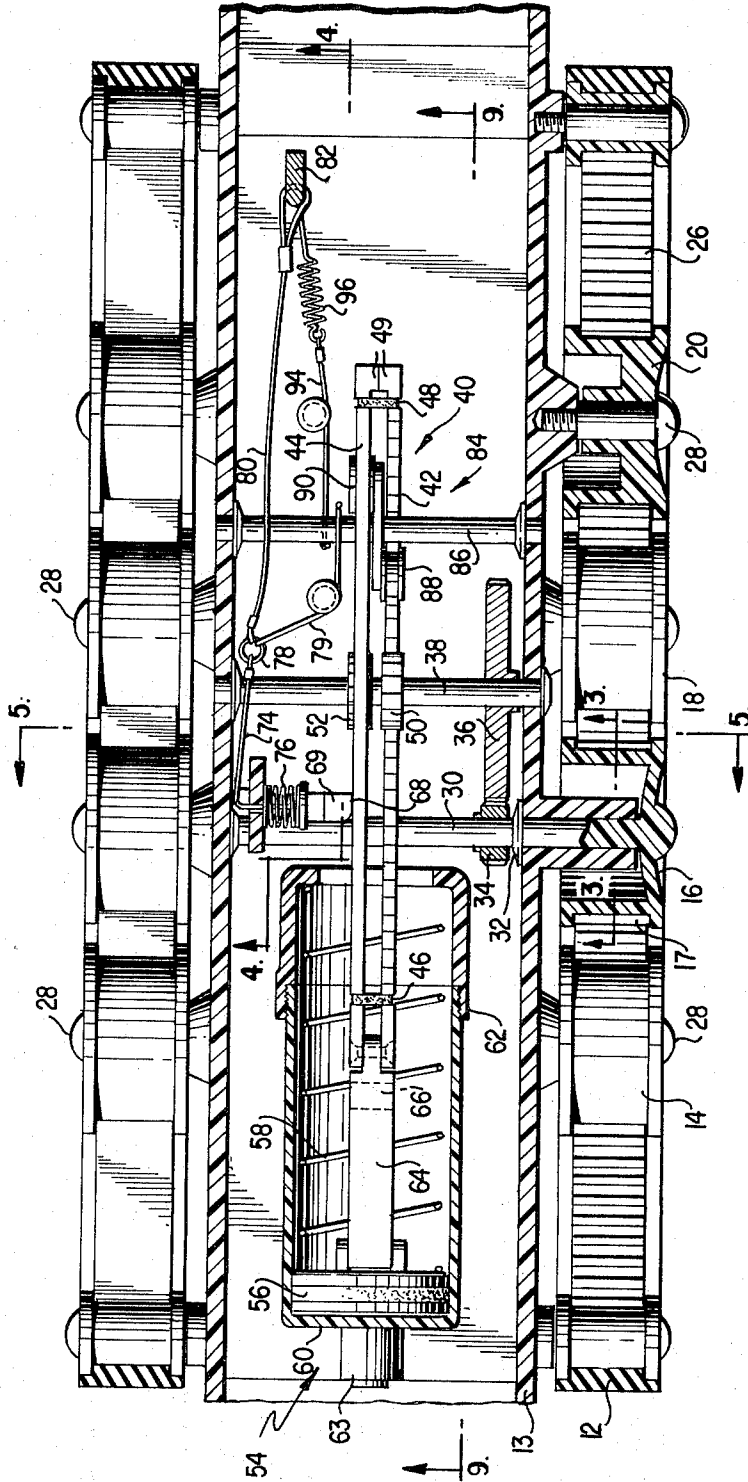


FIG. 2



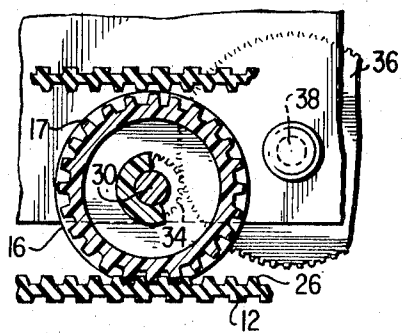


FIG. 3

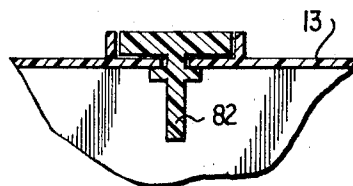


FIG. 6

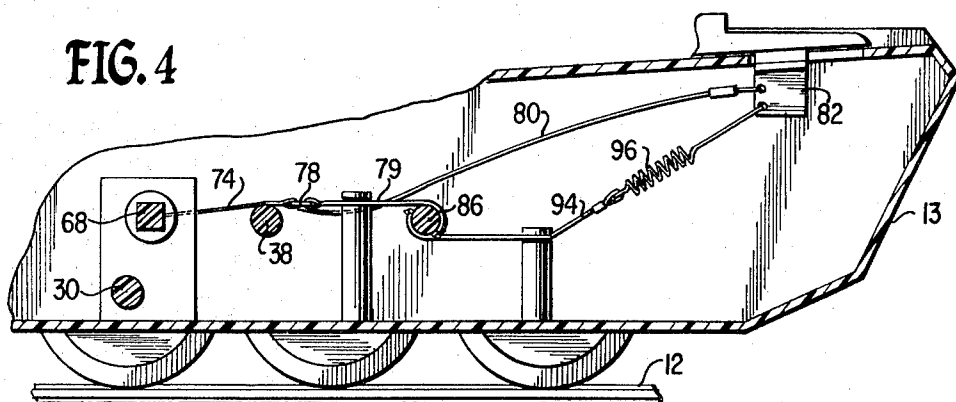


FIG. 4

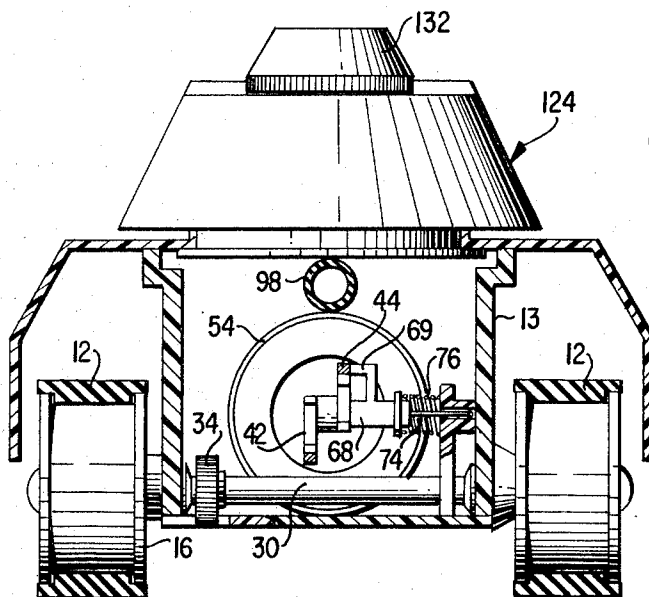


FIG. 5

FIG. 7

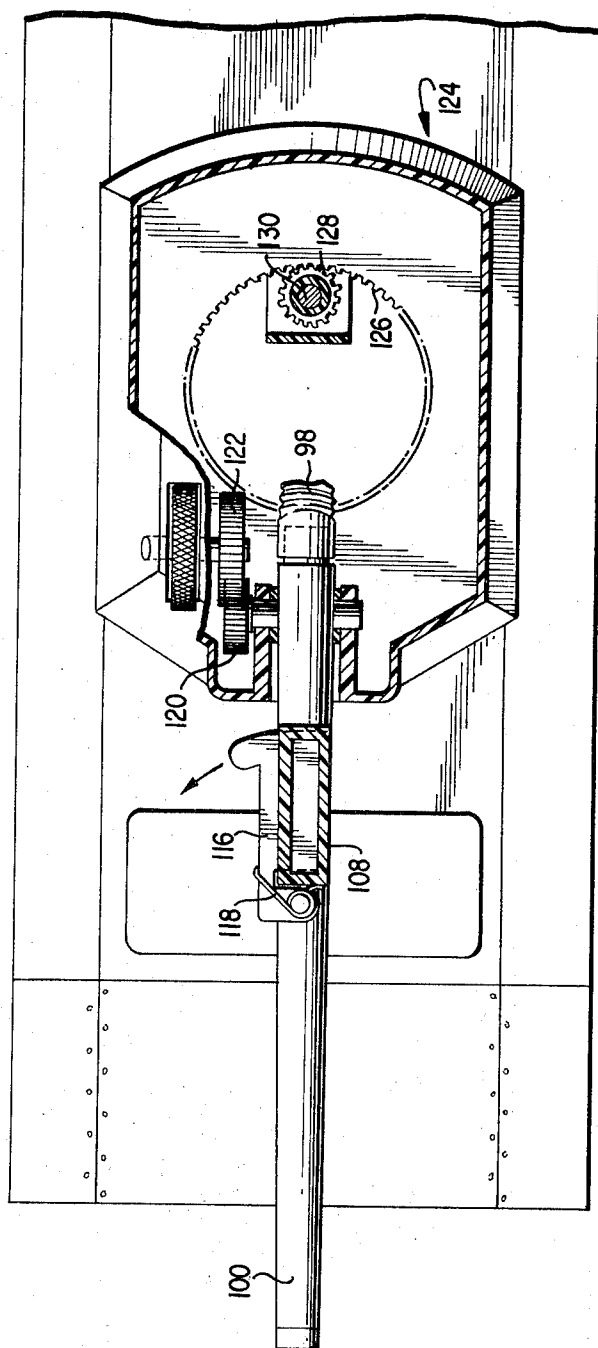
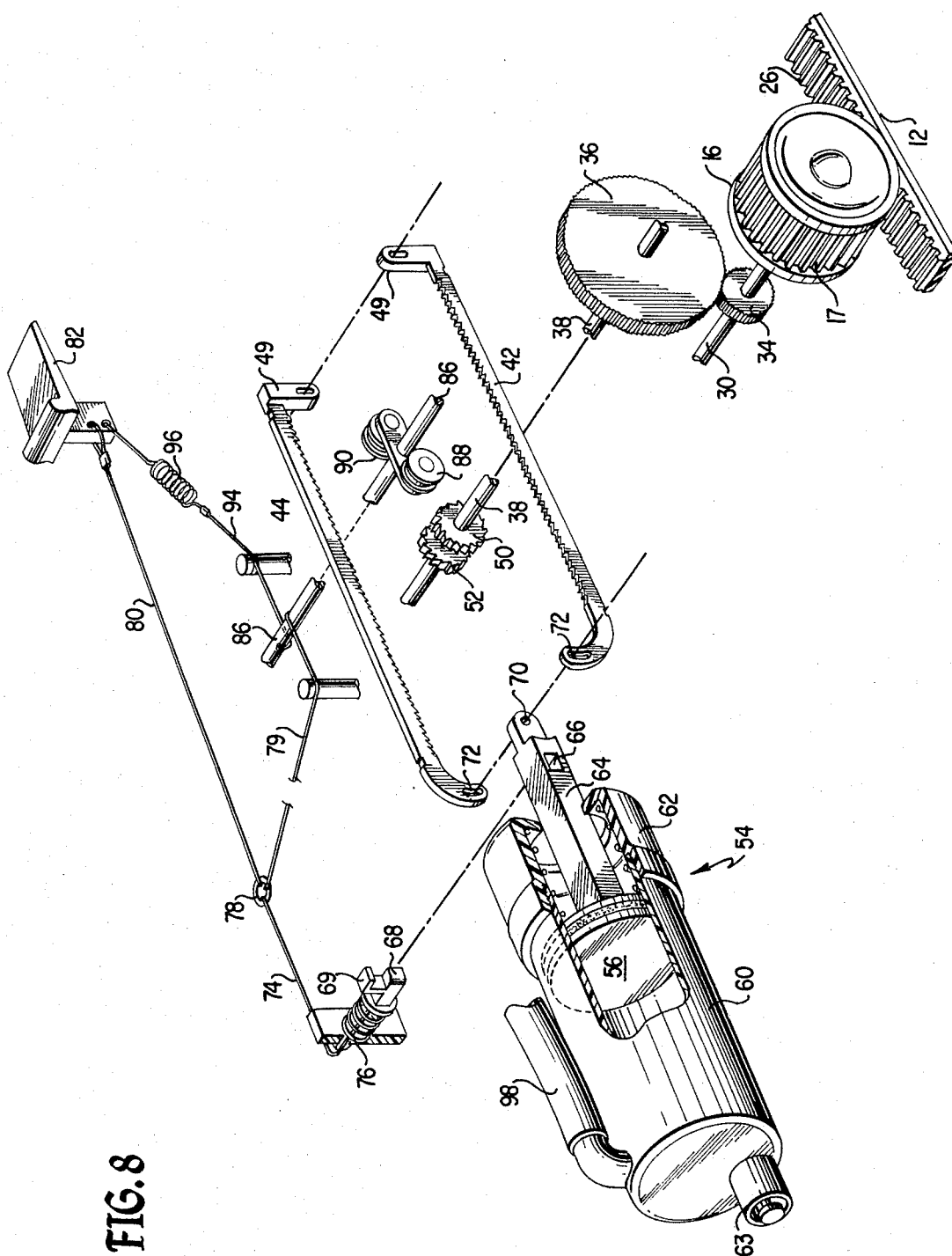


FIG. 8



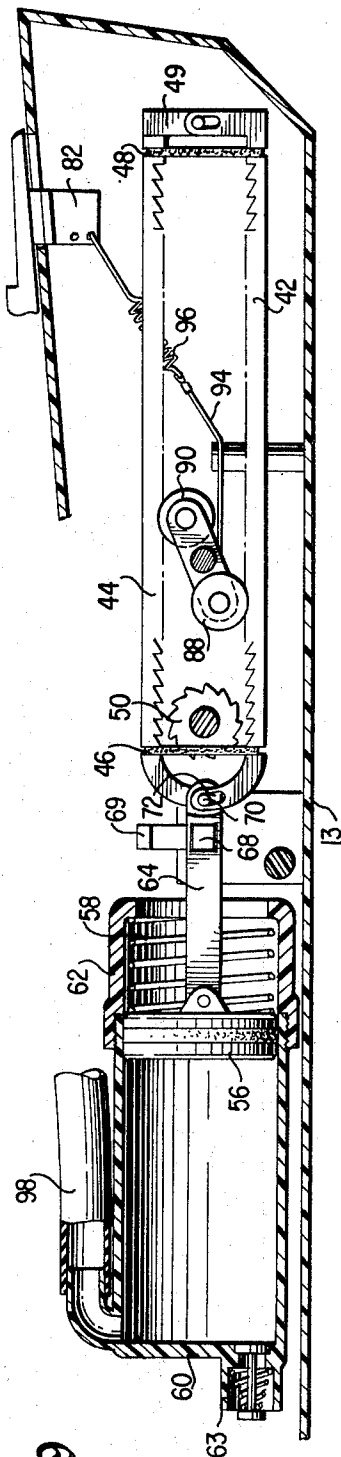


FIG. 9

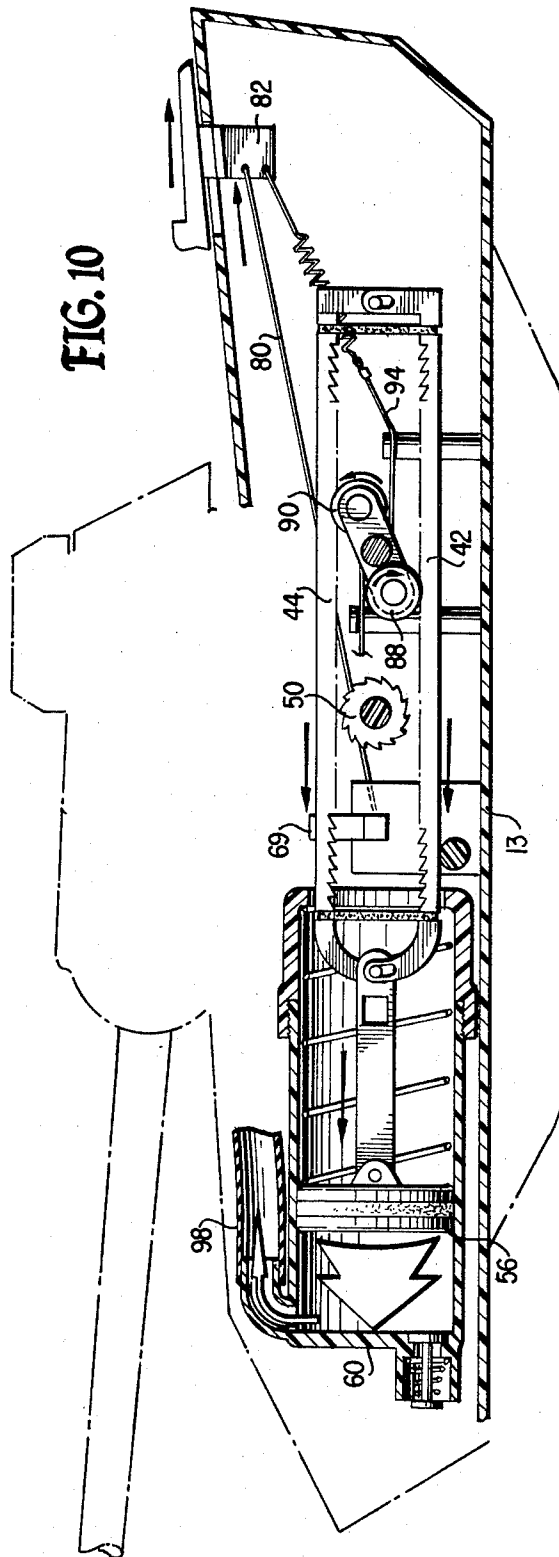


FIG. 10

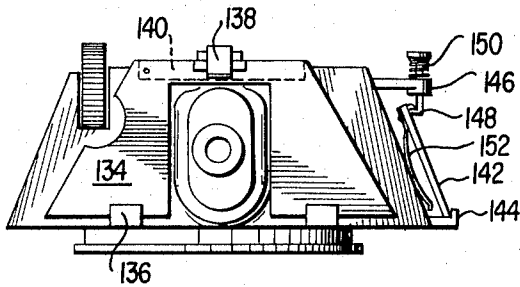


FIG. 11

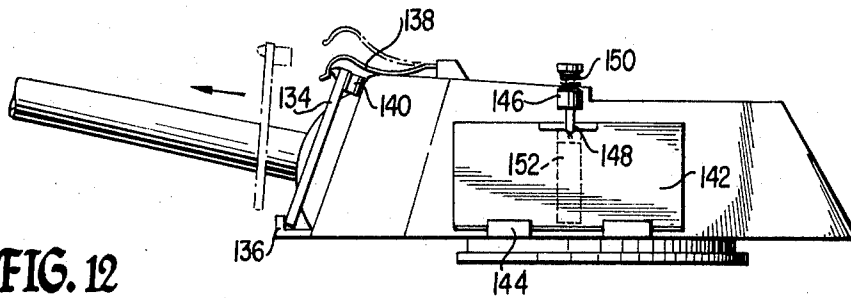


FIG. 12

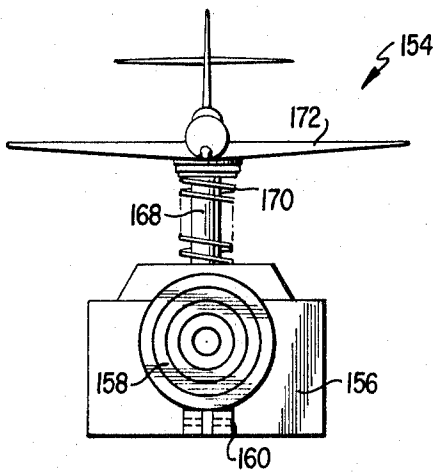


FIG. 13

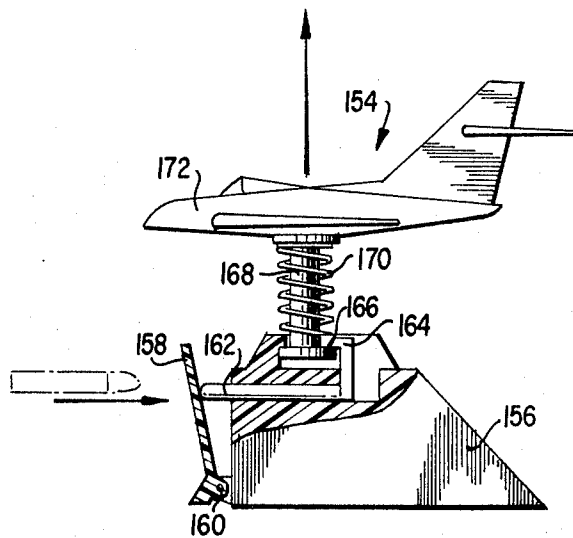


FIG. 14

TOY TANK

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to toy tanks of the type which permit an operator to selectively fire a harmless projectile. More particularly, the invention relates to toy tanks which have a projectile firing mechanism that is cocked by motion of the tank and which include a spring-powered piston that forces air through a cylinder and hose into a barrel causing the projection of a harmless foam shell from the tank's gun barrel.

Description of the Prior Art

United States Pat. No. 2,551,109 discloses a toy military tank having a disc-shaped missile ejecting plunger slidably mounted within the rear end of a barrel and affixed to the front end of an ejector rod extending through the rear end of the barrel. A coil spring is disposed between the disc-shaped ejecting plunger and the rear end of the barrel for forwardly propelling the ejector plunger to force a projectile from the barrel. The ejector rod is driven by an eccentric mechanism which is revolved by forward travel of the toy tank. This construction has a number of disadvantages not found in the present invention. Namely, the projectile firing mechanism therein is only powered by forward motion of the toy tank. Additionally, the firing mechanism does not permit the operator to select the time when a projectile may be fired. Finally, the projectile firing mechanism is not activated by compressed air.

United States Pat. No. 3,065,569 discloses a self-propelled toy tank which includes a gun assembly for firing projectiles. The gun assembly is activated by rotary motion of the turret assembly in response to forward or reverse motion of the toy tank. Projectiles are discharged from the gun in response to rotary motion of a cam which is driven by motion of ratchet and pawl members. This construction differs substantially from the present invention. In response to forward or reverse vehicle motion, the pawl members described in the referenced patent continue to drive the firing mechanism of the vehicle to intermittently discharge projectiles. Unlike in the present invention, this projectile firing mechanism does not have a cocking mechanism which permits the operator of the toy tank to selectively discharge projectiles. Additionally, projectiles in the referenced patent are not discharged by a blast of compressed air.

United States Pat. No. 3,213,844 discloses a pull toy which intermittently discharges projectiles in response to forward motion. A gear train having one gear with a cutout toothless section is used to drive an axle to which a cord is attached. The cord is also secured to a plunger which forces projectiles from the barrel of the pull toy in response to expansion of a spring located between the plunger and the end of the barrel. During forward motion of the pull toy, the spring is compressed by the wrapping of the cord of the plunger around the axle. When the cutaway gear section reaches the point of disengagement with the gear train, the axle to which the cord is secured is free to rotate allowing the spring to expand and force the projectile from the pull toy's barrel. A number of differences exist between the present invention and that disclosed in the referenced patent. First, compressed air is not used to expel projectile from the pull toy's barrel. Second, the projectile firing mechanism is only powered by forward motion of

the pull toy. Finally, no mechanism is provided for cocking the firing mechanism to permit an operator to selectively discharge a projectile.

SUMMARY OF THE INVENTION

The disadvantages and limitations of the prior art are solved by the present invention which provides a toy tank which has a projectile firing mechanism which is cocked by forward or reverse motion of the toy tank.

The toy tank comprises a chassis having a projectile firing mechanism mounted thereon. A plurality of wheels are rotatably secured to the chassis of the vehicle. A pair of ratchet wheels having their teeth facing in opposite directions are driven by rotation of one of the wheels. The ratchet wheels impart linear motion to a pair of associated racks. The racks are mechanically coupled to a projectile firing mechanism. Forward or reverse motion of the chassis moves the racks and projectile firing mechanism from a first position to a second "cocked" position. The firing mechanism consists of a piston, piston housing and associated piston spring located therein. The spring is secured to the piston and rests against one end of the cylinder. Motion of the racks and the firing mechanism between the first and second "cocked" position progressively compresses the spring. The piston is connected to a connecting rod by a sear spring. As the piston spring becomes successively compressed by linear motion of the racks, the sear rides against the side of the member until it reaches a longitudinal position with respect to the member which permits the sear to drop into the sear hold. When the sear is disposed within the hole in the member, the projectile firing mechanism is in its cocked position. The end of the piston housing located away from the piston is coupled to a hose which connects the piston housing air chamber to the barrel of the toy tank. The firing mechanism includes a trigger which is attached to the sear by a cable. Pulling of the trigger withdraws the sear from the sear hold which allows the piston spring to force the piston rapidly down the piston housing to produce a blast of compressed air within the housing, hose and barrel. The compressed air within the barrel forces a foam-tipped projectile therefrom.

An idler mechanism is located between the two racks. The idler mechanism is connected to the trigger via a section of cable which has a spring located therein. Another section of cable connects the sear with the idler mechanism. As the racks and firing mechanism reach the cocked position, the dropping of the sear into the sear hole rotates the idler counterclockwise to produce a disengagement of the racks from the ratchet wheels. In this position, the section of cable connected between the sear and idler mechanism is taut. During the pulling of the trigger, the section of cable connecting the trigger to the idler mechanism is stretched taut to hold the idler mechanism in the position where the racks are still disengaged from the ratchet wheels. Disengagement of the racks from the ratchet wheels during firing permits the racks and firing mechanism to travel from the second cocked position back to the first position.

A magazine containing a stack of foam-tipped projectiles is located on top of the barrel. A stop is provided between the stack of shells contained in the magazine and the bore of the barrel to permit the loading of a single shell into the gun barrel prior to firing. Sub-

sequent to firing, the stop must be removed to allow another projectile to drop down into the barrel. Suitable gearing is provided to permit elevation and rotary position adjustments of the gun.

Targets are provided which disintegrate upon impact by a projectile fired from a tank gun.

Brief Description of the Drawings

FIG. 1 is a longitudinal cross-section of the present invention;

FIG. 2 is a horizontal cross-section, in plan, on lines 2—2 of FIG. 1;

FIG. 3 is a vertical cross-section of drive wheel, on lines 3—3 of FIG. 2;

FIG. 4 is a vertical cross-section of trigger and sear mechanism, on lines 4—4 of FIG. 2;

FIG. 5 is a vertical cross-section on lines 5—5 of FIG. 2;

FIG. 6 is a vertical cross-section through trigger, lines 6—6 of FIG. 1;

FIG. 7 is a horizontal cross-section of turret and gun barrel, on lines 7—7 of FIG. 1;

FIG. 8 is a vertical cross-section, lines 8—8 of FIG. 2;

FIG. 9 is as above with trigger released and piston moving;

FIG. 10 is an exploded perspective view of operating mechanisms, showing component relationships;

FIG. 11 is a front elevation of turret, showing fly-off target in position;

FIG. 12 is a side view of turret;

FIG. 13 is a front elevation of free-standing target;

FIG. 14 is a side view, partly in section, of FIG. 13.

Detailed Description of the Invention

Referring to the drawings, the tank 10 consists of a chassis having a frame 13 to which are secured a plurality of wheels 14, 16, 18 and 20 which preferably are constructed from plastic. Unlike the other wheels, wheel 16 has an outside surface section having gear teeth cut therein. Tracks 22 are rotatably supported by wheels 14, 16, 18 and 20. Tracks 22 have a plurality of cleats or grousers 24 cut in their outside surfaces to form a tread pattern which simulates the pattern of a real tank tread. FIG. 3 shows a cross sectional view of the drive assembly of the tank's chassis. One of the tank treads 22 has a plurality of drive teeth 26 moulded on the entire inner surface. The drive teeth 26 mesh with the teeth in wheel 16. Axle screws 28 secure each of the wheels to the frame 13 of tank 10. An axle 30 is non-rotatably secured to wheel 16. Lateral retaining flanges 32 prevent axial movement of axle 30. Pinion gear 34 is secured to axle 30 and meshes with gear 36. Wheel 16, axle 30, retaining flanges 32 and pinion gear 34 are formed as an integral unit. A ratchet assembly 40 comprising a lower rack 42, upper rack 44, lead rubberband 46, rear rubberband 38, spacers 49, lower ratchet wheel 50 and upper ratchet wheel 52. Secured to gear 36 is axle 38 which in turn has a pair of ratchet wheels 50 and 52 attached to it. The teeth of the respective ratchet wheels are inclined in different directions to produce unidirectional drive of one of the racks 42 or 44 by its associated ratchet wheel 50 or 52. Lateral retaining flanges are provided to prevent axial movement of axle 38. Gear 36, axle 38, ratchet wheels 50 and 52 and the retaining flanges may be formed as an integral unit. Lead rubberband 46 and rear rubber-

band 48 are looped around the end of racks 42 and 44 to bias them in a position of engagement with ratchet wheels 50 and 52 to permit both engagement and disengagement therewith. Depending upon the direction of motion of chassis 10, one of the racks 42 or 44 is driven by its associated ratchet wheels 50 or 52 while the other rack 42 or 44 slips from engaging its associated ratchet wheel 50 or 52. Forward or reverse motion of ratchet wheels 50 and 52 produces linear motion of upper and lower racks 50 or 52 from a first position to the second cocked position. As is clear from the above explanation, the racks 42 and 44 and the associated ratchet wheels 50 and 52 permit the conversion of either forward or reverse motion of the vehicle chassis into linear motion of the racks 42 and 44. As will be explained hereinafter, it is this linear motion which is used to cock the projectile firing means of the present invention.

The projectile firing means comprises the following parts: a piston assembly 54 is disposed inside of piston housing 60; the piston assembly comprises piston 56, piston spring 58, piston housing 60 and cap 62, air inlet valve 63 and connecting rod 74. Connecting rod 64 has a square sear hole cut in the end protruding from the piston assembly 54. Pivot point 70 and pivot slot 72 are provided as a flexible coupling between connecting rod 64 and the racks 42 and 44. Air inlet valve 63 is provided in piston assembly 54 to permit the entry of atmospheric air into cylinder 60 during movement of the firing mechanism from the first position to the second cocked position. During the firing of the projectile firing mechanism, air inlet valve 63 is closed. Sear 68 and sear extension 69 are biased against connecting rod 64 by sear spring 76. Connecting rod 64, sear hole 66, sear 68 and extension 69 and sear spring 76 comprise a cocking means. As racks 42 and 44 successively move from their first position to their second cocked position, spring 58 is compressed while sear 68 and extension 69 ride against the side of connecting rod 64 until sear 68 drops into sear hole 66 in response to the pressure applied by spring sear 76. When this occurs, the projectile firing mechanism is cocked. Once the projectile firing mechanism is cocked, the operator of the toy tank may selectively discharge a foam-tipped rubber projectile by pulling trigger 66. Referring to FIG. 4, trigger 82 is secured to sear 68 via sear cable 74, sear cable ring 78 and ring to trigger cable 80. Trigger 82 is attached to an idler assembly comprised of shaft 86, lower idler wheel 88 and upper idler wheel 90, by means of trigger to shaft cable 94 and spring 96. Idler wheel operator cable 79 connects sear cable ring 78 with the idler assembly. The function of idler assembly is to disengage the racks 42 and 44 from ratchet wheels 50 and 52 when the firing mechanism is in the cocked position. As sear 68 drops into sear hole 66, cable sections 74, 79 and 80 become taut causing counterclockwise rotation of idler assembly. When the firing mechanism is uncocked, cable sections 74, 79 and 80 are loose. When the operator of the toy tank desires to discharge the projectile firing mechanism, trigger 82 is pulled causing sear 58 to be withdrawn from sear hole 66. At this juncture, spring 96 is stretched causing cable section 94 to become taut which holds idler assembly in its counterclockwise position. At this time as shown in FIG. 9, piston 56 moves rapidly forward in piston housing 60 under force of spring 58. Racks 42 and 44 are the firing mechanism are now in their "un-

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cocked" position. Upon release of trigger 82, spring 96 is free to compress causing cable 94 to become loose again. In response to the loosening of the tension of cable 94, the idler assembly rotates in a clockwise position to cause racks 42 and 44 to engage ratchet wheels 50 and 52. In this position, forward or reverse motion of the chassis of the toy tank will again cause the cocking of the projectile firing mechanism. As is apparent from FIGS. 9 and 10, during firing of the projectile firing mechanism, piston 56 moves rapidly forward in piston housing 60 causing the rapidly compressing air to be forced from the housing into hose 98 into the gun barrel.

FIGS. 1 and 7 show the details of the gun mechanism. The gun mechanism comprises a shell magazine 90 used for reloading purposes and a barrel 84. Barrel 100 of the gun contains a shell retaining magazine 108 and flexible tube 98 which couples the piston housing 60 with barrel 100. Venturie 104 functions to prevent the drawing of a foam-tipped projectile 114 down barrel 100 in response to cocking of the firing mechanism. Shell magazine 108, which contains a plurality of stacked foam-tipped shells 114, is mounted on top of barrel 100. Each shell 114 is preferably foam-tipped to preclude any possibility of injury to operators of the toy tank or to bystanders. Inside of shell magazine 108 is located magazine follower 110 which has a spring secured to the upper side thereof and which rides on magazine cap 112. The function of magazine follower 110 and spring is to force the stack of shells 114 down through hole 105 into the bore 102 when load gate 116 is withdrawn. Load gate 116 is withdrawn from magazine 108 by pivoting around the illustrated pin. Load gate spring 118 returns the load gate 116 into the magazine upon release.

The turret assembly 124 is pivoted around a shaft to permit vertical adjustment of gun barrel 100. The actual adjustment of the vertical height of gun barrel 100 is controlled by the turning the illustrated knurled knob which is mechanically coupled to cogged gears 120 and 122. The leftward or rightward positioning of gun barrel 100 is accomplished by turning knurled knob 132. Secured to knurled knob 132 is a shaft 130 which has pinion gear 128 secured to the other end. Turning of knurled knob 132 causes rotation of pinion gear 128 which in turn rotates internal gear 128 and the attached tank turret 124.

FIGS. 11 and 12 show the details of a disintegrating target which is mounted on the turret of the toy tank described above. Each of these targets is designed to disintegrate upon being hit by a foam-tipped projectile 108 fired from the tank's gun. A front target 134 and one or more side targets 142 are attached to turret 124 of the toy tank. On each side of the turret 124 to which a disintegrating target 134 or 142 is attached, one or two groove retaining channels 136 and 146 are provided to detain each of the respective targets 134, and 142. Targets 142 are attached to turret 124 by retaining channels 142 and 144 while remaining target 134 is secured to turret 124 by retaining channel 136 comprised of two separated sections. At the top of each target 134 or 142 there is provided a latch spring which may be either a leaf spring 138 or a coil spring 150. Behind each target there is a target separation leaf spring 140 or 152 which is compressed when the target is attached to the tank turret. Upon being struck by a projectile fired from an opponent's toy tank, the target 134

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or 142 is driven slightly backward causing compression of a target separation leaf spring 140 or 152. This slight rearward movement of the targets 134 or 142 allows the disconnection of the target 142 from latches 148 or the latch associated with target 134. At this instant in time, the latching spring 138 or 150 pulls the latch free from interference with the target which permits compressed leaf spring 140 or 152 to expand causing the target 134 or 142 to separate permanently from the tank turret 124.

FIGS. 13 and 14 show a disintegrating target which is located remote from the toy tank. The disintegrating part of the target is secured to a mounting block 156 by means of horizontally slidable latch 164. The disintegrating part of each target has an elongated cylindrical shaft 168 having a coil spring 170 disposed therearound and joined to the under-surface of object 172. When the disintegrating part of the target is "snap-fit" into base 156, spring 170 is compressed. Secured to the front of base 156 is the target bull's-eye 158. The target bull's-eye 158 is secured to mounting base 156 by means of pin 160. The underside of the target bull's-eye prevents the pivoting of bull's-eye 232 farther forward than the position shown. Upon the sustaining of a direct hit by a foam-tipped projectile 114 or other projectile, bull's-eye 158 drives plunger 162 toward the rear. As soon as latch 166 clears the overhang of flange 166, spring 166 instantly expands causing the disintegrating part 172 of target 220 to fly away from mounting base 156.

It should be noted that any one of a plurality of materials may be used to make the constituent parts of the toy tank and target. However, plastic is preferable for the manufacturing of most parts because of its superior molding properties and minimal expense.

While the invention has been described in detail with respect to a preferred embodiment, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended, therefore, to cover all such changes and modifications which are embraced within the scope of the appended claims.

What is claimed is:

1. A toy tank which is movable in forward and reverse directions comprising in combination:

a moveable chassis having a first means for respectively converting forward and reverse motion of said chassis into forward and reverse rotary motion;

second means mechanically coupled to said first means for converting the forward and reverse rotary motion of said first means into linear motion, said second means being moveable between first and second positions;

cocking means responsive to linear motion of said second means for detaining said second means in the second position in response to forward or reverse motion of said chassis;

projectile firing means capable of selectively ejecting projectiles upon command of an operator, said projectile firing means being mechanically coupled to said second means; and

a trigger mechanism mechanically coupled to said cocking means for selectively releasing said cocking means from detaining said second means in said second position upon pulling by an operator.

2. In a toy tank of the type recited in claim 1 wherein said first and second means respectively comprise:
 an axle coupled to a wheel rotatably supporting said chassis, said axle having a pair of ratchet wheels secured thereto and;
 a pair of racks each respectively coupled to a different one of said pair of ratchet wheels, each coupled ratchet wheel and rack respectively being responsive to a different direction of chassis motion whereby in response to forward or reverse chassis movement, said racks are moved from said first position to said second position.
3. In a toy tank of the type recited in claim 1 wherein said projected firing means comprises:
 a piston, a piston housing having two ends, a spring mechanically coupled to said piston and disposed between said piston and the first end of said housing;
 a section of hose having two ends, one end of said hose being connected to the second end of said housing, a barrel having a bore coupled to the other end of said hose.
4. In a toy tank as recited in claim 3 wherein said projectile firing means further comprises a magazine coupled to said barrel for loading projectiles into said barrel.
5. In a toy tank as recited in claim 4 wherein said magazine for loading projectiles comprises a bin shaped for holding a stack of projectiles; said bin having two ends, an end plate having a spring secured thereto, said end plate and spring applying force on the end of said stack of projectiles farthest from said bore of said barrel and a stop interposed between the bore of said barrel and the other end of said stack of projectiles, said stop being removable from a position between said barrel and said stack of projectiles to permit said end plate and spring to force a projectile into said barrel.
6. In a toy tank as recited in claim 3 wherein said cocking means comprises:
 a connecting rod attached to said piston and extending away from said piston housing, said connecting rod having a sear hole therein,
 a sear disposed in close proximity to said member and being extendable into said hole of said connecting rod to lock said second means in said second position and
 a sear spring for urging said sear against said connecting rod and into said sear hole.
7. A toy tank as recited in claim 6 wherein said trigger mechanism comprises:
 a trigger;

- a cable attached to said trigger and to said sear and; an idler assembly being attached to said cable and located between said racks, said idler assembly having two possible positions between said racks, the first position of said idler assembly not splitting the racks to prevent their engagement with said ratchet wheels, the second position of said idler assembly splitting the racks to prevent engagement with said ratchet wheels, said idler assembly being biased in said second position when said second means is in said second position.
8. A toy tank as recited in claim 1 further comprising a target which disintegrates upon impact, said target comprising:
 a mounting assembly;
 a target which is fired upon;
 said mounting assembly being held in contact with the target by at least one channel located on said mounting assembly, and a latch at the other end, said latch having a latch spring secured thereto, said latch spring being stretched when said target is secured to said mounting assembly but being free to compress when said latch is not contacting said target; and
 a target separation spring secured to said target and compressed against said mounting assembly, said target separation spring having a compressed state when said mounting assembly and target are latched together, but upon impact of a projectile upon said target and the unlatching of said latch from said target; said target separation spring expanding to an uncompressed state which does not contact the mounting assembly whereby said target is separated from said mounting assembly.
9. A toy tank as recited in claim 7 wherein the sections of cable between said sear and said idler and said sear and said trigger are taut when said gear is engaged in the sear hole in said member, and the section of said cable between said idler and said trigger being loose when said sear is engaged in the sear hole in said member except when said trigger is pulled.
10. A toy tank as recited in claim 3 further comprising a one-way air valve mechanically coupled to said projectile firing means, said valve permitting the entry of air into said piston housing in response to movement of said second means from said first position to said second position but not permitting the exit of air from said piston housing through said one-way valve in response to movement of said second means from said second position to said first position.

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