SELF-PROPELLED TOY TANK

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The present invention relates generally to children's toys and models and relates specifically to a toy model tank which may be assembled by a child and which is self-propelled with respect to the ground and further self-propelled with respect to motions of the tank turret with respect to the main tank body.

It has long been recognized that two of the most desirable features which may be incorporated in a toy or model intended for use by young boys reside first in the play value associated with the movement of the model in simulation of the movements of the prototype of that model and second, in constructing the toy or model from a kit of disassembled pieces. Therefore, it is desirable in any toy model to provide a well organized kit including a variety of different pieces which may be easily and securely assembled to produce a model incorporating faithful reproductions of the prototype.

It has long been recognized that a model incorporating movable features in simulation to the movable portion of the model prototype are far more effective to stimulate the imagination of a child playing with such toy or model than a similar model lacking such movable features. For example, in a toy tank as disclosed herein, it is desirable to provide movable treads and tread supporting wheels on a tank in simulation of the treads and wheels on a real tank. Still further, a toy or model would be improved by providing an internal motor power to drive the tank treads from within such that the tank would be self-propelled either in a forward or reverse direction. In addition, as the turret of a tank is rotatably movable in a horizontal plane with respect to the tank body, it is advantageous to provide a rotatable mount for the tank turret such that it may simulate the turret movement of the prototype. Such turret movement may be further advantageously improved by providing an internal motivating power for movement of the tank turret such that, once set in motion, the toy tank would move with respect to the ground and the tank turret would also rotate with respect to the tank body.

Where the model being constructed is patterned after a prototype having moving parts, in addition to it being desirable that such moving members be incorporated into the model, it is further desirable that the mechanical elements which produced such movements be visible to and capable of being assembled by the child playing with the toy. Such features provide a distinct educational feature involving the mechanisms of assembly of a whole from a group of different parts and further provide an understanding of the mechanical workings of moving machinery. The extraordinary educational value of such kit assemblies has been long recognized by parents, educators and by those people involved in this activity in the toy industry.

A reasonably close resemblance to the prototype of the toy in toy tank, the ability to provide movable features to further stimulate the child's imagination, and the provision of the toy in kit form such that an educational experience is provided in the assembly of the kit, all combine to produce a toy product which provides a variety of advantageous features for the child who uses the same.

Accordingly, it is an object of the present invention to provide movable features in simulation of the movements of the prototype of the toy tank.

It is a further object of the present invention to provide a toy model having both the educational features involved in assembling a model and the play value associated with a toy model having mechanical movements.

It is within the contemplation of the present invention to provide a self-propelled toy tank wherein the finished toy tank is self-propelled both in forward and reverse movement and in movement of the tank turret with respect to the tank body.

It is still a further object of the present invention to provide a toy model having self-propelled mechanisms wherein the driving mechanisms of the tank may be understood by the child playing therewith.

It is a further object of the present invention to provide a drive for a toy vehicle which may propel the vehicle as a whole with respect to the ground and which may also activate a secondary movement of one portion of the vehicle with respect to another portion of the ground.

It is still a further object of the present invention to provide a toy self-propelled vehicle wherein a toy gun is fired automatically at intervals as the vehicle is moved with respect to the ground.

In accordance with the present invention there is provided a self-propelled toy tank which may be constructed by a child from a group of disassembled pieces. The toy tank comprises a main tank body or hull and a turret assembly provided with means pivotally interconnecting the turret assembly and tank hull for rotational movement therebetween. A plurality of spring-loaded tread supporting wheels are provided extending outwardly from opposite sides of the hull and a pair of parallel endless treads are secured around said wheels on opposite sides of the hull. At least one of the tread supporting wheels on each of the opposite sides of the hull are internally driven and cooperating motion-transmitting means are provided on the treads and on the driven wheels to interconnect the same. A motor is housed within the hull and is operatively connected to a speed reduction means which is connected in turn to the driven tread-supporting wheels to transmit power from the motor to the endless treads for propelling the tank with respect to the ground.

Turret driving means are provided which is effective to rotate the turret with respect to the tank hull in response to movement of the turret driving means. Included in the turret driving means is a vertical rotatable shaft which is operatively engaged with the main drive means and a turret crank which is both secured at right angles to and rotatable with the vertical shaft. A turret crank arm is pivotally connected at one of its ends to the turret crank and at its other end to the turret at a point spaced from the rotational center thereof, said turret being rotatable in response to movement of the turret driving means through an oscillatory horizontal motion.

A battery compartment is formed within the hull and at least one electrical battery is contained therein. Conducting means are provided making electrical contact between the battery and the motor and manually operable switch means are provided secured to the conducting means to selectively activate and deactivate the motor.

The above brief description as well as further objects, features and advantages of the present invention will be best appreciated by reference to the following detailed description of a presently preferred embodiment, when taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a side elevational view of a toy model tank according to the present invention;
FIG. 2 is a schematic diagram of a battery, switch and motor which provides the motive power to propel the toy tank;
FIGS. 3 and 4 are detail views of the endless treads used in the tank of FIG. 1, FIG. 3 being a plan view of a portion of the tread illustrating the joints of the tread.
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FIG. 5 is a plan view of the tank shown in FIG. 1 with the upper portion of the tank removed to expose its inner mechanisms. This view is taken along the lines 5—5 of FIG. 1 looking in the direction of the arrows and illustrates portions of the hull including the battery cavity, the tank gun activating pawls, the motor, the speed reduction unit, and the main driving unit, the turret drive and the spring mounts for the tread-supporting wheels.

FIG. 6 is a partial sectional view taken along the lines 6—6 of FIG. 5 looking in the direction of the arrows illustrating the drive linkages from the speed reduction unit to the driven tread-supporting wheels and further illustrating the turret drive mechanisms and the linkages connected to the turret.

FIG. 7 is a detail perspective view of the turret crank arm which interconnects the turret drive mechanism and the tank turret.

FIG. 8 is a sectional and enlarged view of a portion of the toy tank shown in FIG. 1 taken along the line 8—8 of FIG. 1 looking in the direction of the arrows and illustrating the tread-supporting wheels including the upper idler wheels and the lower spring-loaded road wheels.

FIG. 9 is an enlarged sectional view of a portion of FIG. 8 taken along the line 9—9 of FIG. 8 and looking in the direction of the arrows illustrating the spring mounting for the road wheels.

FIG. 10 is a sectional view taken along the line 10—10 of FIG. 5 illustrating the tread drive shaft and its connection to the driven tread-supporting wheels for propelling the toy tank.

FIG. 11 is a sectional view taken along the line 11—11 of FIG. 10 and looking in the direction of the arrows illustrating the motion transmitting means interconnecting the driven wheels and the treads.

FIG. 12 is a partial perspective view of a portion of the tank hull illustrating the battery compartment formed therein and further illustrating the mounting for the gun activating pawls.

FIG. 13 is a bottom view of a portion of the hull of a toy tank of FIG. 1 with the battery compartment cover removed illustrating a pair of batteries in position therein.

FIG. 14 is a plan view of the toy tank of FIG. 1, on a slightly reduced scale, showing the turret in its center line position and illustrating, in phantom, the turret drive mechanisms and having portions of the turret broken away to illustrate the pivotal mount of the turret on the tank hull.

FIG. 15 is a bottom view of the tank turret taken along the line 15—15 of FIG. 14 looking in the direction of the arrows including a portion of the top deck of the hull illustrating the interconnection therewith and showing the connection of the turret crank arm to the turret assembly and to the turret crank.

FIG. 16 is a sectional view taken along the line 15—15 of FIG. 14 looking in the direction of the arrows, showing the interconnection of the turret crank arm with the turret.

FIG. 17 is a sectional view taken along the line 17—17 of FIG. 14 and looking in the direction of the arrows illustrating the pivotal interconnection of the tank turret to the tank hull.

FIG. 18 is a partially schematic plan view of the tank turret shown in solid line in its on-center position and shown in phantom at the two extremes of its oscillatory motion and further illustrating the turret driving mechanisms in each of these positions.

FIG. 19 is an exploded perspective view of the tank gun mechanism.

FIG. 20 is an enlarged perspective view of a portion of breech of the gun assembly with portions broken away illustrating the spring mount for the gun hammer.

FIG. 21 is an enlarged and partially sectional view of the firing cam and ratchet member of the tank gun interconnected with the gun pawl members.

FIG. 22 is an enlarged central sectional view of the tank gun illustrating the main firing pin of the gun in the cocked position of the gun immediately before firing.

FIG. 23 is a view similar to that of FIG. 22 showing the firing cam and the gun hammer in position immediately after a shell has been fired in the gun; and,

FIG. 24 is a plan view of that portion of the toy tank which is shown in FIG. 21 illustrating the inter-action of the firing cam and ratchet with the gun pawl members and specifically showing the arc through which the firing cam and ratchet member travels as the tank gun is cocked and fired.

Before proceeding to a detailed description of the various elements contained within the toy tank according to the present invention, a general description will be given of the main features of the illustrative toy tank disclosed herein. In FIG. 1 a model tank, generally designated by the numeral 10, is illustrated having a tank hull 12 and a turret assembly 14 positioned thereon. A plurality of rotatable spring-loaded road wheels which support the tank are mounted along the parallel sides of the tank hull 12. There are provided, in the present illustrative embodiment, five such spring-loaded road wheels which are designated by the numeral 16. At the forward end of the tank hull 12 there is mounted for rotation an idler wheel 18 and at the rear end of the tank hull 12 there is mounted, in straight line alignment with the road wheels 16, an internally driven wheel 20. An endless track 22, which is provided with internal projections 24 which engage within complementary depressions within the driven wheel 20 is engaged about the driven wheel 20, the idler wheel 18 and the road wheels 16. Three idler wheels 28 are mounted above the road wheels 16 and are positioned to support the tank tread 22 between the driven gear 20 and the idler wheel 18. It will be appreciated that the tank 10 will move forward when the driven wheel 20 is rotated by the drive mechanisms which are contained within the tank 10 and which will be described in detail below. When the driven wheel 20 is rotated in a clockwise direction, as seen in FIG. 1, the tank 10 will be moved in a forward direction and, conversely, if rotated in a counterclockwise direction, the toy tank 10 will move rearwardly.

The turret assembly 14 is pivotally secured to the upper deck of the hull 12 as may be best seen in FIGS. 14 through 16, a detailed description of which will be given below. There is provided on the turret assembly 14 a gun at its forward end, generally designated by the numeral 30, which is intended to simulate the 76 mm. gun that is standard equipment on the M-41 light tank, prototype of the toy tank 10. A machine gun 32 is secured to the upper portion of the turret assembly 14 as are a variety of hatches and external equipment intended to reproduce in miniature the equipment normally carried by the M-41 light tank.

The turret assembly 14 is rotatable with respect to the hull 12 and exhibits an oscillatory motion about its center line of the tank 10 as the tank is moved in a forward or rearward direction. This motion is shown diagrammatically in FIG. 18 and is motivated by a turret driving mechanism which is linked to the main drive mechanism of the tank 10. As seen in FIG. 18, a turret crank arm 34 is pivotally secured at one end at the pivot 36 to the turret assembly 14 at a point removed from its center of rotation. Thus, it will be appreciated that when the turret crank arm 34 is moved laterally, it will produce a rotational motion of the turret assembly 14 about its vertical centerline. The rearward end of the turret crank arm 34 is pivotally connected at 38 to a turret crank 40 which rotates in a horizontal plane and which is powered through appropriate gearing by the main drive mechanism. As the main drive mechanism propels the tank 10 in a forward or rearward direction, the turret...
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crank 40 rotates about its central vertical axis thus translating the turret crank arm 34 is an oscillatory forward and backward motion is obtained by the combination of the solid and dotted line configurations of FIG. 18. This motion then produces a rotational oscillatory motion of the turret 14 and the gun 30 which is secured thereon as indicated by the directional arrows in FIG. 18.

The generalized description of the toy model tank 10 according to the present invention is completed by brief reference to the gun 30 which is automatically centered and fired as the toy tank 10 is moved with respect to the ground as the turret assembly 14 oscillates as described above. As may be best seen in FIGS. 19 through 24, the gun 30 includes a gun barrel 42, a breech 44, a spring loaded hammer 46 mounted in the breech and a shell chamber generally designated by the numeral 48. A firing cam and circular ratchet member, generally designated by the numeral 50, is pivotally mounted on the gun 30 and includes ratchet teeth 52 arranged around the periphery thereof and two uniformly inclined, 180° firing cams 54. Rotation of the firing cam and ratchet member 50 about its central pivot point is effective to cock the hammer 46 to the position shown in FIG. 22. Further rotation of the firing cam and ratchet member 50 moves one end of the firing cam 54 past the hammer 46 which is then allowed to move in response to its spring loading towards the shell chamber 48 where a firing prosecution 56 engages a shell 58 and imparts momentum thereto to send it out through the gun barrel 42.

This above described action is generated by movement of the firing cam and ratchet member 50 about its central axis in response to relative movement between the firing cam and ratchet member 50 and the pawl member 60 which are rigidly secured within the tank hull 12 below the turret assembly 14. As seen in FIG. 22, the firing cam and ratchet member 50 extends below the bottom level of the turret assembly 14 into the hull 12 and is positioned to engage the pawl member 60. As the turret is moved through its oscillatory path described and shown in FIG. 18, the cam and ratchet member traverses an arc which is indicated in FIG. 24 such that the ratchet teeth 52 are moved transversely with respect to the pawl members 60. This motion is effective to rotate the firing cam and ratchet member 50 thereby to cock and fire the gun 30.

Reference will now be made to the drawings in this disclosure for a specific description for the mechanisms contained in the toy tank 10 according to the present invention.

As has been described above in general terms, a tank tread 22 is looped about the driven wheel 20 at the rearward end of the tank hull 12 and about the idler wheel 18 at the forward end thereof and rides underneath the spring-loaded road wheels 16 and above the idler wheels 28. The spring loading of the road wheels 16 is such that the tank 10 may relatively easily move over irregularities in a given surface, the spring loaded road wheels 16 moving independently to absorb irregularities. The road wheels 16 have external peripheral surfaces 62 which are essentially of cylindrical configuration with the exception of a central annular groove 64 formed therein. The central annular groove 64 is to intimately accept the projections 24 on the tread 22 which projections 24 are positioned longitudinally along the midpoint of the tread 22. The engagement of the projections 24 within the annular grooves 64 is effective to maintain the road wheels 16 in proper orientation with respect to the road wheels 16 and to the tank 10.

Each road wheel 16 is mounted upon an axle shaft 66 for free rotation and the axle shaft 66 is in turn, rigidly secured to one end of a knee action arm 68, best seen in FIG. 8 and in phantom in FIGS. 1 and 9, at right angles to the axle shaft 66. The opposite end of the knee action arm 68 is secured to a road wheel mounting arm 70 which is received within its complementary opening in the side wall 72 of the hull 12. It will thus be appreciated that a solid member is formed comprising the axle shaft 66, the knee action arm 68 and the road wheel mounting arm 70. As the road wheel 16 rotates within its complementary opening in the side wall 72, the axle shaft 66 moves vertically with respect to the hull 14 and, specifically, with respect to the bottom wall 74 thereof. At the inner end of the road wheel mounting arm 70 there is rigidly secured a spring contact lever, generally designated by the numeral 76, which is provided with a first arm 78 which carries a pin 80 and a second arm 82 which serves as a stop engaging against the bottom wall 74 to prevent full rotation of the road wheel mounting arm 70. A double armed spring 84 is secured about a portion of the road wheel mounting arm 70 which extends into a hub of the side wall 72 and has its first arm positioned against the bottom wall 74 and its second arm positioned against the pin 80 extending from the first arm 78 of the spring contact lever 76. As seen in FIG. 9, the spring 84 is effective to bias the spring member lever 76 for counterclockwise rotation about the road wheel mounting arm 70 and thereby is effective to bias the knee action arm 68 for counterclockwise rotation thus biasing the road wheel 16 in a downwardly direction with respect to the tank hull 14. This knee action spring loading mechanism is repeated on each of the road wheels 16 such that an independent suspension is provided for each road wheel 16 to allow independent movement of the road wheel 16 in response to irregularities in the surface over which the tank 10 travels.

Above the road wheels 16 and extending outwardly from the side wall 72 of the tank hull 12 there are provided idler wheels 28 which are essentially similar in configuration to, but smaller than, the road wheels 16. The idler wheels 28 are mounted on idler wheel shafts 86 which are, in turn, mounted on the side wall 72 of the tank hull 12 for rotation within appropriate openings. End members 88 are formed on the inner ends of the idler wheel shafts 86 to hold the idler wheels 28 to the tank hull 12. The idler wheels 28 are provided with a central annular groove 90 which is similar to the annular groove 64 provided in the road wheels 16 and serves a similar purpose. The idler wheel 18 at the forward end of the tank hull 12 is of identical configuration to the road wheels 16, however, it is mounted directly into the side wall 72 of the hull 12 in a manner analogous to the mounting of the idler wheels 28.

As best seen in FIG. 10, the driven wheels 20 at the rearward end of the tank 10 are mounted on a central wheel drive shaft 92 which is mounted for rotation with bearings 94 housed in openings provided within the side walls 72 of the tank hull 12. The wheel drive shaft 92 is rigidly secured to the driven wheels 20 at either of its ends such that the two driven wheels 20 are rotationally bound together. The wheel drive shaft 92 is driven by the tank drive mechanisms which will be described in detail below.

The driven wheels 20 are provided with a central annular opening 96 which is adapted to receive the projections 24 carried on the central line of the treads 22 and is, in that respect, similar to the annular grooves 64 and 90 described in connection with the road wheels 16 and the idler wheels 28 respectively. However, the annular grooves 96 of the driven wheels 20 are provided with teeth or partitions 98 at periodic interval which intervals correspond to the spacings between respective projections 24 on the treads 22. The teeth 98 and the projections 24 combine to provide a motion transmitting means which effectively drive the tread 22 about its prescribed path under impetus of rotation of the driven wheel 20. The interengaging action of the driving teeth 98 and the tread projection 24 is illustrated in the partial sectional view of FIG. 11.

In FIGS. 3 and 4, the tread 22 is shown in detail as including individual treads 100 which are interconnected.
by flexible couplings 102 thus forming a continuous belt-like structure. The tread 22 is endless such that it coop-

ons. The pivotal interconnection between the turret assembly 14 and the tank hull 12 is formed with a top plate 142 which has a sloping rear portion 144 and a downwardly sloping front portion 146. When the top plate 142 is placed onto the hull 12, the combination of the top plate 142, the bottom wall 74 and the side wall 72 form a body cavity within the tank hull 12 which houses the self-propulsion mechanisms to be described in detail below.

The pivotal interconnection between the turret assembly 14 and the tank hull 12 at the top plate 142 is best seen in FIGS. 1, 14, 15, 16 and 17. The lower portion of the turret assembly 14 is formed with a substantial vertically semi-circular ring member 145 integrally formed with the body of the turret assembly 14 and onto which are attached the securing means for the pivotal interconnection. Into the internal annular shoulder formed by the turret ring 148 there is fitted an annular pivotal securing member, generally designated by the numeral 150, which is adapted to mate with a complementary opening member in the top plate 142. The top plate 142 is formed with a central circular opening 152 and the edges immediately adjacent the opening 152 are formed with an upwardly facing bearing surface 154. The securing member 150 includes a first washer-shaped annular member 156 having a lower bearing surface 158 which coacts with the top plate bearing surface 154 to support the turret assembly 14 on the top plate 142. The securing member 150 has a second washer-shaped annular member 160 smaller than and joined to the first annular portion 156 by a short vertical annular joining section 162. The outer diameter of the circular joining section 162 is complementary to the diameter of the top plate opening 152 such that the annular securing member 150 fits partially within the top plate opening 152 with the interacting bearing surfaces 154, 158 supporting the turret assembly vertically and the outer diameter of the joining section 162 mating against the inner surface of the opening 152 to prevent movement of the turret assembly 14 in a direction transverse to the top plate 142.

Further interengaging securing members are provided to prevent vertical movement of the turret assembly 14 with respect to the top plate 142. These further means include a series of downwardly and outwardly extending fingers 164 on the securing member 159 which extend below the surface of the top plate 142 and outwardly of the central opening 154 of the top plate 142 thus anchoring the turret assembly securely to the top plate. The fingers 164 may be best seen in FIGS. 15 and 17 and in FIG. 14 where they are shown in phantom. Assembly of the turret assembly 14 and the annular securing member 150 to the top plate 142 is facilitated by a series of assembly cut-outs 166 formed along the outer edges of the opening 152. In assembly, the securing member 150 is placed over the opening 152 with the fingers 164 aligned with the assembly cut-outs 166 and is then lowered into contact with the top plate 142, with the securing fingers 164 being placed within the cut-outs 166. The turret assembly is then turned engaging the securing fingers 164 on the undersurface of the top plate 142 there by firmly securing the turret assembly to the tank hull 12 for pivotal movement with respect thereto.

As has been described above in general and will be described here specifically, the turret assembly 14 is oscillated in rotational motion by means of a turret crank arm 34 which is pivotally engaged by the pivot 36 with the turret assembly 14 at one end and with the turret crank 40 at the pivot 38 at its other end. The motion produced is diagrammatically shown in FIG. 18. The actual oscillatory motion of the turret assembly 14 in the present illustrative embodiment, is one wherein the turret is oscillated an equal number of degrees first to the right and then to the left of the center line position as the tank is propelled along the ground. The turret crank arm, a detail of which is given in FIG. 7, has at its forward end an upward extension 168 and extending therefrom a lateral extension 170. A pivot pin 36 is secured to the lateral extension 170 and extends downwardly perpendicular to and slightly removed from the center line of the turret crank arm 34. As may be seen in FIGS. 14 and 15, the pivot pin 36 is received within a complementary pivot pin opening 36a. At its other end, the turret crank arm 34 is formed with a pivot opening 38a into which is received the pivot pin 38 of the turret crank 40. It will be appreciated that while the turret crank arm 34 is moved later-
ally from front to rear along the length of the toy model tank 10, the pivot pin 36 will be similarly moved, thus driving the turret through an oscillatory rotational motion as indicated in FIG. 18.

Reference will now be made to FIGS. 5 and 6 for a detailed description of the turret drive mechanism interconnected to the main drive shaft 118. As was stated above, the last gear of the speed reduction unit 14, gear 134 is connected to and causes a spur gear 135 to rotate at the same speed as the main drive shaft 118 to which the gears 134, 136 are secured. It is from the spur gear 136 that a power take-off is attached to provide the rotating force for the movement of the turret crank 40 and the turret crank arm 34 thereby to oscillate the turret assembly 14 as described above. A turret-drive gear crown 172 is operatively connected to the gear 136 and is mounted and secured to a vertical shaft 174. The shaft 174 is rigidly secured to a rotating vertical column which is formed at its upper end with a square lug 178. The square lug 178 is received within a complementary square mounting hole 180 on one end of the turret crank 40 such that rotation of the crown gear 172 moves the shaft 174 which in turn rotates the column 176 thereby rotating the turret crank 40 about the centerline of the rotating shaft and column 174, 176. The rotating column 176 is mounted for rotational movement within a triangular shaped mounted bracket 182 which is supported above the main drive shaft 118, the gear 136 and the crown gear 172 by its supporting legs 184 at each of the three corners of the mounting bracket 182. A bearing 186 is formed in the center of the mounting bracket 182 which receives and supports the rotating column 176.

When the motor 108 of the tank 10 is operating, the speed reduction unit 114 is rotating such that the gear 136 revolves about the axis of the main drive shaft 118. The interconnection between the gear 136 and the crown gears 172 is effective to move the crown gear in rotational motion about its central axis which is thereby effective to rotate the turret crank 40. At the outer end of the turret crank 40 there is formed an upstanding pivot pin 38 which is pivotally engaged within the pivot pin hole 38r formed in the rearward end of the turret crank arm 34, as seen in FIG. 7.

As may be best appreciated by viewing FIGS. 14, 15 and 18, the turret crank arm 34, at the pivot pin opening 38r, is secured to the turret crank pivot pin at one end and at the other end the pin 36 on the arm 34 is placed within the opening 36a in the turret assembly 14 as described above. Upon rotation of the crank 40 about the central axis of the rotating column 176 thereby to drive the turret crank arm 34 through an oscillatory motion and thus, as described above, to rotate the tank turret assembly 14.

Reference will now be made to FIGS. 19 through 24 for a description of the tank gun 30 and of automatic cocking and firing mechanism thereof. As stated in general above, the tank gun comprises a barrel 42 which is secured at its rearward end to the breech 44. A firing hammer 46 is pivotally mounted within the breech 44 by the pivot pin 188 which is secured to the side walls of the breech 44. A second pin 190 is secured to the hammer 46 at a point removed from the pivot pin 188 and a spring 192 is placed about the pivot pin 188, one leg of which spring bears against the top wall of the breech 44, the second leg of which bears against the pin 190. The spring 192 is thereby effective to bias the hammer 46 for rotational movement in a clockwise direction as viewed in FIGS. 20, 22, and 23. It will be appreciated that when the hammer is moved in a counterclockwise direction against the force of the spring 192 to the position shown in FIG. 22, and then is released, it will quickly move under the impetus of the biasing spring 192 in a counterclockwise rotation towards the barrel 42 and will assume a position as shown in FIG. 23. A shell chamber 48 is formed at the rearward end of the barrel 42 and is immediately adjacent to and extends into the breech 44. The shell chamber 48 is formed integrally with the gun barrel 42 and has vertically extending side walls spaced apart a distance such that a series of individual shells 58 may be stacked within the shell chamber 48 as shown in FIG. 21. It will be appreciated that when the hammer 46 goes through its clockwise motion into the position shown in FIG. 23, the shell firing projection 56 engages against the lowermost shell 58 within the shell chamber 48 and imparts sufficient momentum to the shell 58 to send it down the length of the barrel 42 and out the opposite end thereof thereby firing the gun. A firing cam and ratchet member 50 is provided to automatically cock and fire the hammer 46 of the tank gun 30 in response to the rotational oscillatory movement of the turret assembly 14. Thus, the tank 10 moves along the ground and the turret assembly 14 oscillates from its central position, the firing cam and ratchet member 50 is effective to cause the tank gun 30 to be fired at intermittent intervals. The firing cam and ratchet member 50 is of generally circular shape having double ended mounting axle 194 extending along its central axis by which the cam and ratchet member 50 is secured to the lower portion 44a of the breech 44. As may be seen in FIGS. 21, 22 and 23, the pin 194 is received within a channel 196 formed within the downward extension 44a of the breech 44 such that the cam and ratchet member 50 is fixed to rotate about its own central axis.

As may be seen in FIG. 21, the cam and ratchet member 50 is formed with a series of ratchet teeth 52 along its circumferential periphery and in addition has a pair of inclined semi-circular cams 54 extending upwardly from one face thereof. The firing cams 54 are of a continuous inclined development such that as the cam and ratchet member 50 is rotated one turn about its axle pin 194 a cam follower positioned at the beginning of the firing cam 54 is uniformly moved upwardly, or away from the face of the cam and ratchet member 50, to the top end of the firing cam 54. When the ratchet member 50 has rotated through 180°, the cam follower then falls off the sharp right angle edge of the firing cam 54 to fire the gun 30 and then, as the member 50 further rotates, to contact the beginning of the second firing cam 54. The cam follower in this particular case is the lower portion of the hammer 46. Thus, when the cam and ratchet member 50 is rotated, the lower cam following portion of the hammer 46 is moved from the cocked position shown in FIG. 23 to the cocked position shown in FIG. 22. When the cam and ratchet member 50 is rotated beyond 180° the hammer 46 rides off the end of the firing cam 54 to quickly return, under the impetus of the spring 192 to the position shown in FIG. 3 thereby to strike the lowermost shell 58 and fire the same down the length of the gun barrel 42.

Reference will now be made to FIGS. 20 and 24 for a description of the mechanics of moving the firing cam and ratchet member 50 in response to the oscillatory motion of the turret assembly 14. As may be seen in FIG. 20, the breech of the gun 44 and its depending portion 44a is mounted in the forward portion of the turret assembly 14 with the downward projection 44a extending into and below the top plate 142 of the tank hull 12, such that the firing cam and ratchet member 50 extends down into the hull and is essentially perpendicular to the center line of the tank 10. Positioned immediately below the firing cam and ratchet member 50 on the bottom wall 74 of the tank hull 12 are located the pawl members 60 which comprise three metallic elements secured to an uprising pawl mount 200. The pawl members 60 are secured by rivets 202 or the like to the pawl mounts 200 and have upstanding pawl fingers which are arranged to coast with the ratchet teeth 52 of the cam and ratchet member 50.
when the same is moved in relationship to the pawl members 60 in response to the oscillatory motion of the turret assembly 14. As indicated diagrammatically in FIG. 24, the spring gun and therefore the pawl and ratchet member 56 move along a line labeled "Traversing Arc" with respect to the tank hull 12 and therefore with respect to the pawl members 60. This motion may be seen in an elevational view in FIG. 21 where the linear directional arrows indicate the travel of the cam and ratchet member 50 towards the left along the "Traversing Arc" and the arcuate directional arrows indicate the resulting rotational motion of the cam and ratchet member 50 about its axle pin 194. From FIG. 21, it will be appreciated that as the cam and ratchet member 50 is moved towards the left, the individual fingers of the pawl members 60 engage with the individual ratchet teeth 52 and will thereby be effective to rotate the cam and ratchet member 50 about its central axis 194 thereby cocking and firing the gun 30 as described above.

To clarify the foregoing description of the firing mechanism for the gun 30, a typical firing sequence will now be described. As the toy tank 10 is propelled in a forward, or rearward direction, the turret driving mechanism will be operative through the turret crank 40 and the turret crank arm 34 to oscillate the turret assembly 14 in a pivotal motion on either side of the center line position as indicated in FIG. 18. As this occurs, the depending portion 440 of the gun breech 44 will be driven through a similar oscillatory motion producing a substantially lateral displacement between the cam and ratchet member 50 and the pawl members 60 which are rigidly secured to the tank hull 12. This motion, illustrated in FIG. 21, will engage the individual fingers of the pawl members 60 with the individual teeth 52 of the cam and ratchet member 50 thereby driving the cam and ratchet member in a counterclockwise direction as seen in FIG. 21. This will be effective to progressively move the firing cam 54 with the cam follower 55 radially outwardly from the cam pivot 56 to align the ratchet teeth 52 with the cam teeth 53. This will be effective to progressively move the firing cam 54 with the cam follower 55 radially outwardly from the cam pivot 56 to align the ratchet teeth 52 with the cam teeth 53 and to load the firing hammer 46 to move same into its cocked position. It will be appreciated that when the turret assembly 14 moves in one direction the pawl members 60 will engage the teeth 52, but when moved in the opposite direction, the individual teeth 52 will pass over the pawl members 60 without further rotational movement of the cam and ratchet member 50 in that the pawl members 60 are of a metallic resilient material such that they will be temporarily pushed out of the way. Continued oscillatory motion of the turret assembly 21 will be effective to move the cam and ratchet member 50 through complete 180° cycle whereby to be effective to completely cock the firing hammer 46 into the position shown in FIG. 22 and then to release the same firing a shell 58.

A multitude of shells 58 stored in the shell chamber 48 may thus be successively fired as the toy tank moves in a forwardly direction. A child playing with the toy tank 10 may place a plurality of shells 58 into the shell chamber 48 which shells are held in place by the weighed piston and handle 204.

As may be seen in FIG. 5 and in detail in FIGS. 12 and 13, a battery compartment 206 is formed in the bottom walls 74 of the tank hull 12 which is accessible from the underside of the tank 10. The battery compartment 206 is integrally formed with the bottom wall 74 and is shaped to receive two standard electrical dry cells here indicated by the numeral 208. Appropriate contacts 210 are formed at either end of the battery compartment to make contact with the positive end of one cell 206 and the negative terminal of the other cell may be formed to enclose the bottom of a battery compartment 206 which may be provided with extending tabs to engage within the mounting openings 206a to hold said cover to the bottom plate 74 of the tank hull 12. As seen in FIG. 13, an offset is provided in the battery compartment 106 which is formed as a manufacturing expedient and represents the negative portion of the pawl mount 200.

Extending from the contacts 210 of the battery compartment 206 are lead wires 212 as shown in FIG. 5 and shown in the schematic of FIG. 2. The battery contact wires 212, 214 are connected directly to a double pole double throw control switch 216 at its central pair of contacts 220, 222. The switch handle 218 is schematically shown connected to these contacts and may be seen in FIG. 1. Exerting upwardly from the turret assembly 14. A first set of contacts 224, 226 of the switch 216 are connected to the motor 108 through motor lead wires 228, 230. The motor 108 is also connected to a pair of second contacts 232, 234 of the switch 216 through a polarity reversing crossover formed by the wires 236, 238. It will be appreciated that the switch 216 is effective to connect the dry cells 208 to the motor 108 with a choice of either positive or negative polarity. When the switch handle 218 is moved in one direction, it engages the first contacts 224, 226, to power the motor 108 for rotation in one direction. When the handle is moved in the opposite direction, the motor is made with the second pair of contacts 232, 234 to drive the motor in the opposite direction. Thus, switch means are provided to selectively drive the toy tank 10 in either a forward or reverse position.

Further features are provided on the toy tank 10 according to the present invention such as the variety of hatches, combat boxes, ammunition boxes, stretchers, food boxes, securement means, mud rails, the flame-arrestor etc., which may be seen in the drawings herein and which are merely reproductions of the similar articles found on the prototype M-41 light tank. These individual features are incorporated into the toy tank 10 to provide as close a replica as possible of the prototype, it being recognized that a reproduction of the features of the prototype increase the play value of any given toy by stimulating the child's imagination and therefore, increasing the fun and value of the toy.

It will be appreciated that there has been provided in accordance with the present invention a toy tank of a self-propelled nature which incorporates mechanisms which are effective to automatically move the turret of the tank in a horizontal sweep in simulation to the actual sweeping motions of a prototype of the tank and which are further effective to automatically fire the tank gun as the tank travels across the surface of the ground. The individual features of the toy tank have been arranged such that they may be readily assembled by a youngster from individual pieces found in a kit form or alternatively, may be assembled in manufacture and merchandised in assembled form. The toy tank according to the present invention provides substantially faithful reproduction of the features found on the prototype of the tank here in question and provides moving features of the tank which increase the play value and stimulate the imagination of the youngster playing with the toy. Individual movable wheels are provided which are individually spring mounted to accommodate themselves to irregularities in the terrain over which the tank travels, internal self-propulsion mechanisms are provided which power the tank in either forward or reverse direction and mechanical linkage means are provided to internally provide motivating force for the movement of the tank turret and for the firing of the tank gun.

A latitude of modification, change and substitution is intended in the foregoing disclosure and in some instances some features of the invention will be employed without a corresponding feature (not shown) and it is appropriate that the appended claims be construed broadly and in a manner consistent with the spirit and scope of the invention herein.

What we claim is:

1. A self-propelled toy vehicle comprising a hull, a turret assembly, means pivotally interconnecting said tur-
ret assembly and said hull for rotational movement therebetween, a plurality of road wheels extending outwardly from opposite sides of said hull, at least one of said wheels on each of said opposite sides being driven, a motor housed within said hull, speed reduction means operatively connected to said motor, drive means operatively connected to said driven wheels and to said speed reduction means, turret driving means operatively interconnecting said drive means and said speed reduction means to said turret comprising a crank rotatable in response to movement of said turret driving means, a simulated gun mounted on said turret, means for automatically firing said gun in response to movement of said turret with respect to said hull, said gun firing means including a spring loaded firing hammer and a firing cam operatively engaged therewith, actuating means interconnecting said firing cam and said hull to move said cam from an uncocked to a cocked position in response to movement of said turret and to further move said cam to release said firing hammer and fire said gun in response to further movement of said turret with respect to said hull, at least one battery, a battery compartment formed within said hull, conducting means making electrical contact between said battery and said motor, and switch means within said conducting means to provide a manually operable switch to activate and deactivate said motor.

2. A self-propelled toy tank comprising a hull, a turret assembly, means pivotally interconnecting said turret assembly and said hull for rotational movement therebetween, a plurality of tread supporting wheels extending outwardly from opposite sides of said hull, a pair of parallel endless treads secured around said wheels on opposite sides of said hull, at least one of said wheels on each of said opposite sides being driven, motion transmitting means interconnecting said driven wheels and said treads, a motor housed within said hull, speed reduction means operatively interconnecting said motor and said driven wheels, turret driving means operatively interconnecting said speed reduction and drive means to said turret, said turret being rotatable in oscillatory motion in response to movement of said turret driving means, and a simulated gun mounted on said turret, means for automatically firing said gun in response to movement of said turret with respect to said hull, said gun firing means including a spring loaded firing hammer and a firing cam operatively engaged therewith, actuating means interconnecting said firing cam and said hull to move said cam from an uncocked to a cocked position in response to movement of said turret and to further move said cam to release said firing hammer and fire said gun in response to further movement of said turret with respect to said hull.

3. A self-propelled toy tank comprising a hull, a turret assembly, means pivotally interconnecting said turret assembly and said hull for rotational movement therebetween, a plurality of tread supporting wheels extending outwardly from opposite sides of said hull, a pair of parallel endless treads secured around said wheels on opposite sides of said hull, at least one of said wheels on each of said opposite sides being driven, motion transmitting means interconnecting said driven wheels and said treads, a motor housed within said hull, speed reduction means operatively connected to said motor, drive means operatively connected to said driven wheels and to said speed reduction means, turret driving means operatively interconnecting said drive means and said speed reduction means to said turret comprising a crank rotatable in response to movement of said turret driving means, a simulated gun mounted on said turret, means for automatically firing said gun in response to movement of said turret with respect to said hull, said gun firing means including a spring loaded firing hammer and a firing cam operatively engaged therewith, actuating means interconnecting said firing cam and said hull to move said cam from an uncocked to a cocked position in response to movement of said turret and to further move said cam to release said firing hammer and fire said gun in response to further movement of said turret with respect to said hull, at least one battery, a battery compartment formed within said hull, conducting means making electrical contact between said battery and said motor, and switch means within said conducting means to provide a manually operable switch to activate and deactivate said motor.

4. A toy comprising a body, propulsion means for said toy, a turret, means mounting said turret on said body for rotational oscillatory movement with respect thereto, turret drive means for driving said turret in oscillatory motion, and firing means within said turret operable in response to the oscillatory movement of said turret, said firing means including a spring loaded firing hammer and means for cocking and firing said hammer in response to the oscillations of said turret.

5. A toy comprising a body, propulsion means for said toy, a turret, means mounting said turret on said body for rotational oscillatory movement with respect thereto, turret drive means for driving said turret in oscillatory motion and firing means within said turret operable in response to the oscillatory movement of said turret, said firing means including a spring loaded firing hammer and paw and ratchet means interconnecting said turret and said body for cocking and firing said hammer in response to the oscillations of said turret.

6. A toy comprising a body, propulsion means for said toy, a turret, means mounting said turret on said body for rotational oscillatory movement with respect thereto, turret drive means for driving said turret in oscillatory motion including a crank and connecting link interconnecting said turret with said propulsion means, and firing means within said turret operable in response to the oscillatory movement of said turret, said firing means including a spring loaded firing hammer and means for cocking and firing said hammer in response to the oscillations of said turret.