Internal Mechanisms and Power Supply

Internal Mechanisms:

Any device, mechanical or electrical, that connects, transmits, or controls movement and/or any other interactive or embedded capability of the toy.

Power Supply:

Battery, or any other such electric delivering device, that provides the means necessary to operate the internal mechanisms which provide interactive capabilities for the toy.

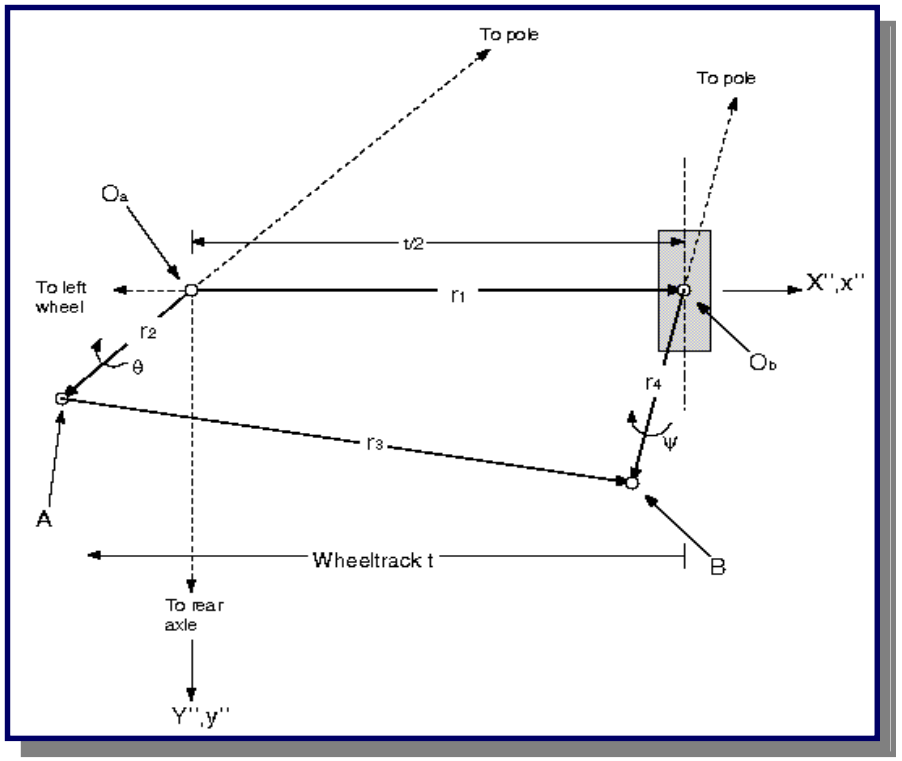
General Uses/Applications:

- Translational and rotational motion
- Water firing system
- Stamp II processor power supply and control
- Sensors, lights, & sounds
- Remote capabilities

Internal Mechanisms

Steering Linkage:

- Servo controlled with link to remote interface
- Double four-bar mechanism design with one reflected across vehicle centerline
- Curvature theory design with minimal third order position design
- Plus/minus 90° servo rotation to control minimum turning radius comparable to existing RC and full size vehicles
- Link force, friction, and deployment time analysis
- Tight turning radius without turret rotation vs. larger turning radius with turret rotation



Internal Mechanisms

Motor Selection:

- One vs. two motor design schemes

- Motor selection drivers – speed, acceleration, weight, torque, current/voltage usage & size

- Torque vs. speed capabilities (gearing) and corresponding amp and volt usage as comparable to measurements from existing RC cars, RC tank, and pump devices available

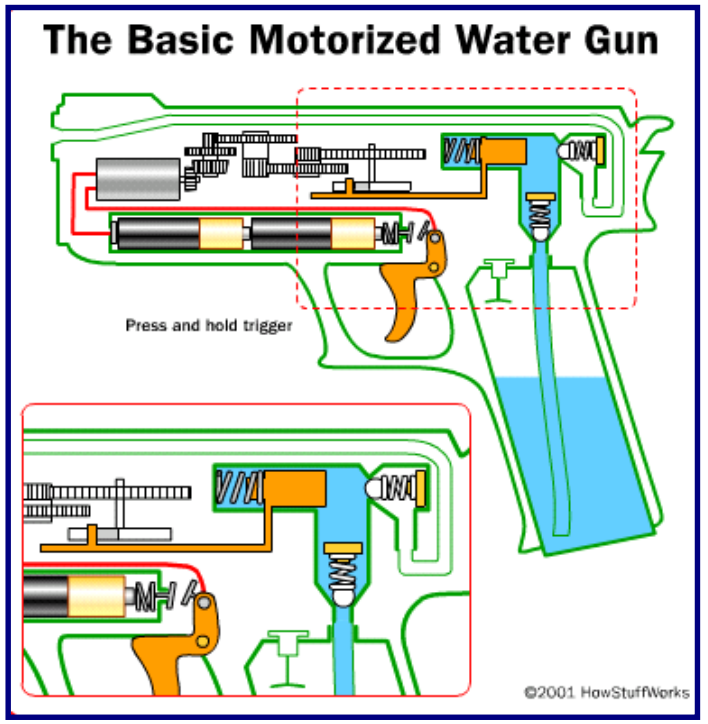
- Motor cost and availability (suppliers)

- Power transmitting devices (shafts and linkages) from motor to wheel and/or pump – shaft rotational deflections and plastic yield strengths for given torques

- Rotational design speeds from 250 to 2750 rpm to deliver speeds ranging from 1 to 12 ft/s

Internal Mechanisms

Pump Design:



- Hydraulic/pneumatic design trashed due to initial pressure requirements, piston drive train torque depletion, cost, and longevity of use

- Diaphragm pump design optimal but cost is too high

- Impeller pump design cost efficient and simple but does not have “start-stop” capability and exceed power limitations

- Motor-gear design chosen as potential fluid firing system

- Preliminary and intermediate fluid loss and pressure requirements demand approximately 3 atmospheres of gage pressure to meet “middle of the road” Supersoaker® specifications

- Initial water weight and shooting time analysis resulted in approximately 100 shots at 0.3939 in^3 per shot for a 22 oz volume of water weighing 1.54 lb_m

Internal Mechanisms

Water Presence Sensor System:

- Water activated switch created by bridging a circuit

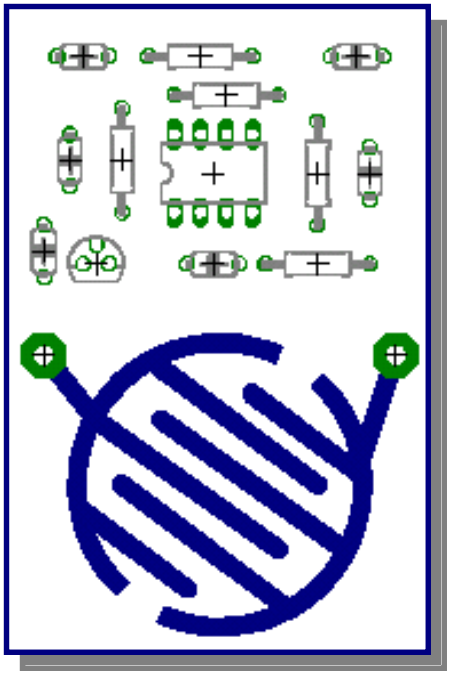
- Stamp II reads voltage change and signals LED and sound activation as well as cuts power to the drive train, firing mechanism, and/or turret control

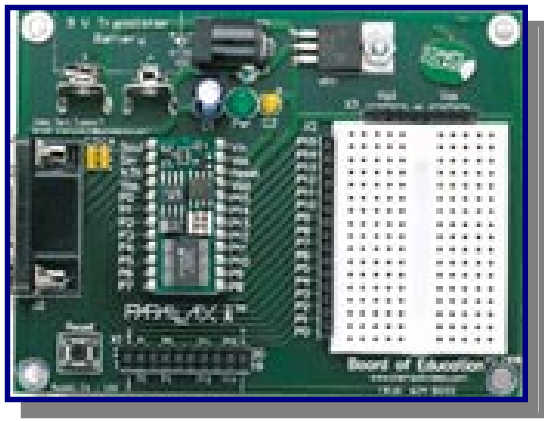
- LED voltage requirements are 1.2 to 1.6 volts and 10 mA

- Sound power requirements include approximately 1.5 volts at 7.5 mA and run at 8 ohms resistance

- Signal conditioning necessary from Stamp II to LED/sound producing device

- Teflon, silicon, or some other water resistant coating to surround water sensing copper contacts





Power Supply

Potential circuit diagram: