

Alternative Power Source for Dental Hygiene Device

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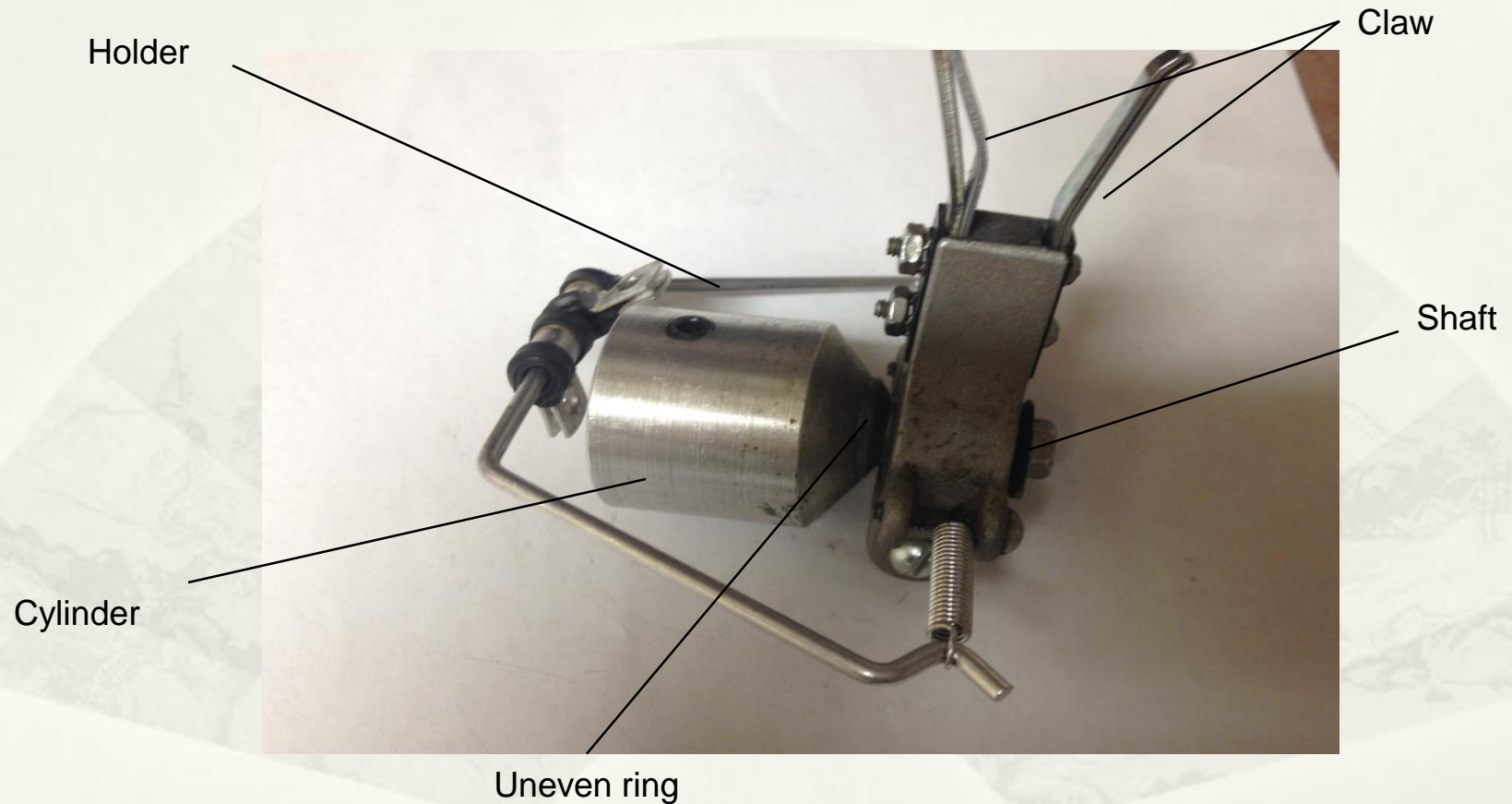
Mechanical Wig-L-Bug

- Use a hand crank as substitute for electric motor
- Hand crank speed ~ 50 RPM
- Gear ratio of 1:100

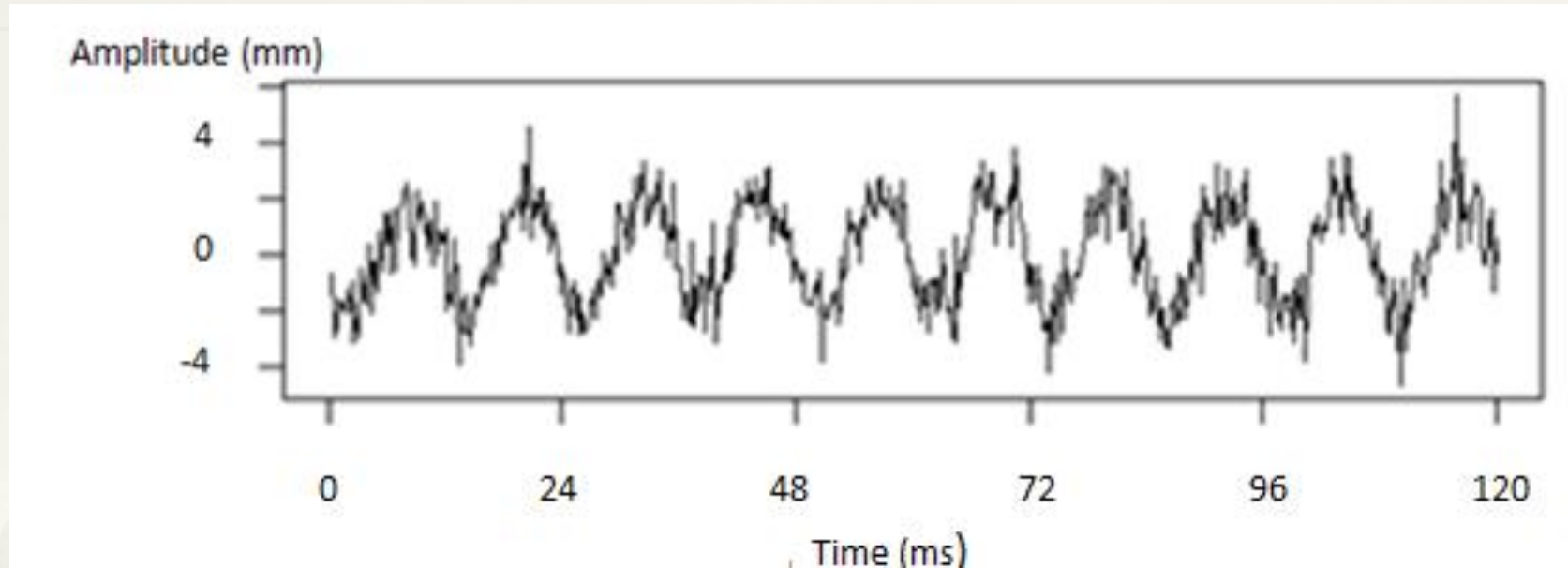
Wig-L-Bug Motion



Wig-L-Bug Motion Analysis

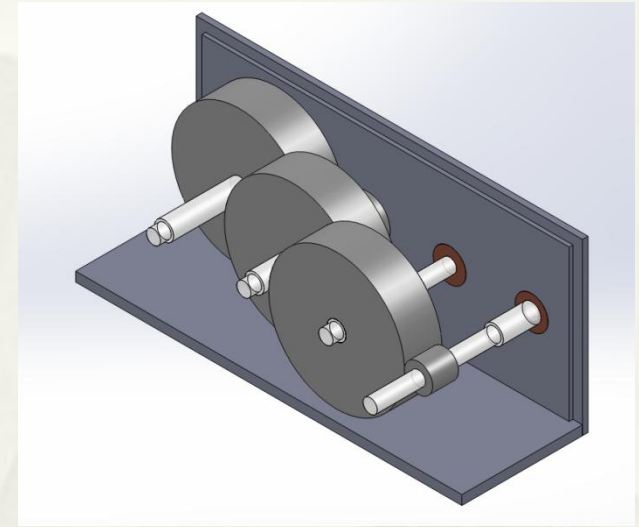
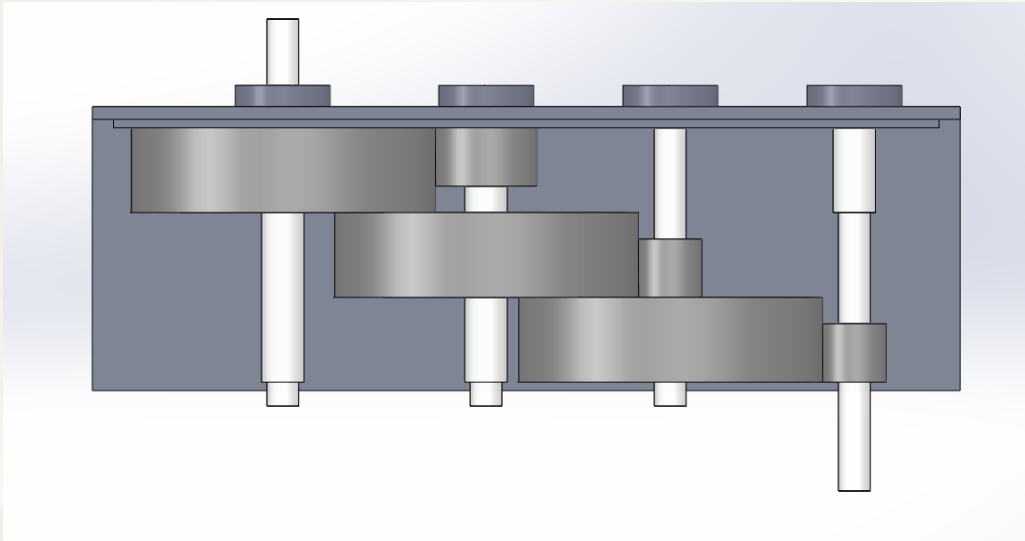


Wig-L-Bug Motion Analysis



Force on Claw Part	76 N
Stress on Claw Part	0.34 Mpa

Gearbox Design



- Gears are compact and efficient
- Steel gears are required for 1:100 gear ratio

Gearbox Forces

Gear Load Calculations

	RPM	z	Pitch diameter	torque (Nm)	tooth load (N)	pitch line velocity (FPM)	center dist (inch)
P1	72	72	91	20	433	69	2.40
G1	217	24	30	7			
P2	217	72	91	7	144	208	2.18
G2	1042	15	19	1			
P3	1042	72	91	1	30	997	2.18
G3	5000	15	19	0			

Modified Lewis Calculations

	max load (lbs)	max load (N)	pitch line velocity
10mm	107	475	40
.5inch	108	482	200
20mm	210	934	50
Plastic 5mm	23	101	800

Gear Forces



- High carbon steel spur gears
- 20 degree pressure angle, 20 pitch
- Plain hub (no keyway)

Attaching Gears to Shaft

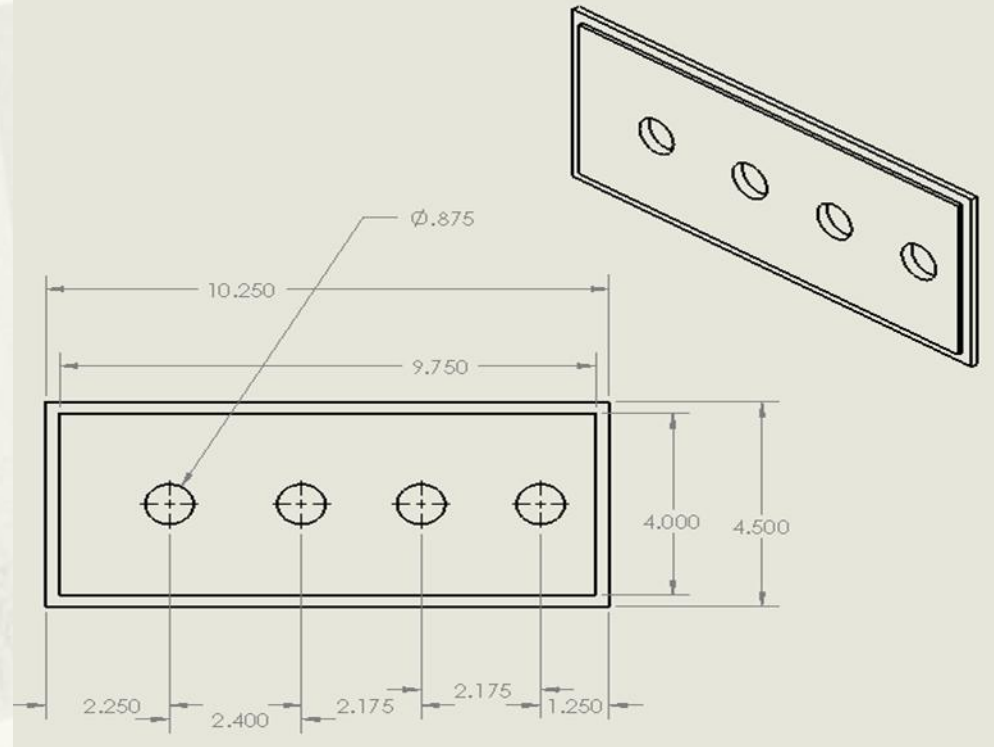
Shaft, Gear and Pin

- Designed shaft at the machine shop
- Drill a hole through the gear
- Attach a pin



Polycarbonate

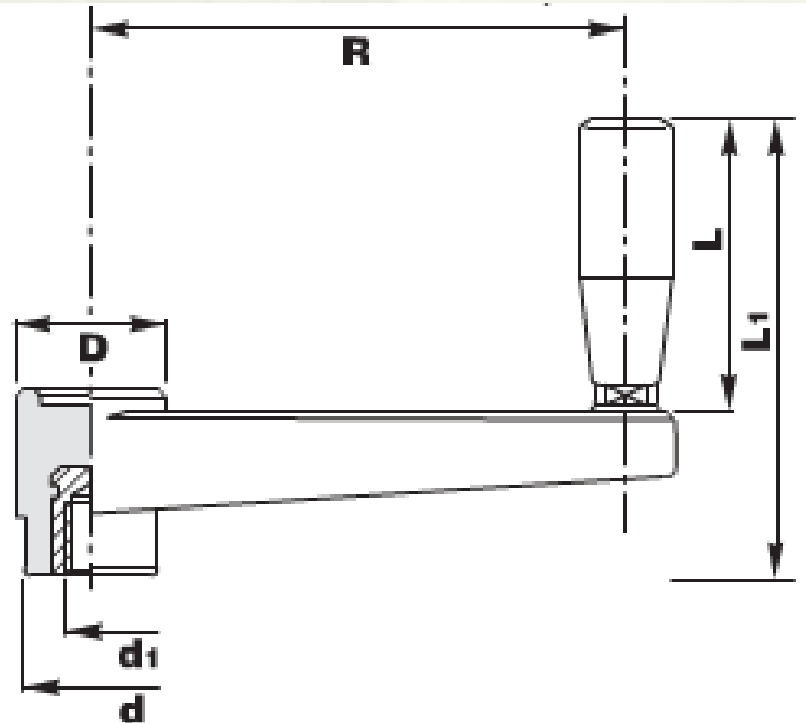
- Easy to cut
- Easy to glue
- Cheap
- Strong



Crank Handle

* Specifications

Bore Dia. d (in)	1.58
Arm L. R (in)	7.29
Hub Dia. D (in)	1.85
Handle L. L (in)	3.39
Overall Ht. L_1 (in)	5.28
Bore Dia. d_1 (in)	0.375
Material	PA6Nylon with 30% reinforced fiber



Crank Handle

Handle Installation

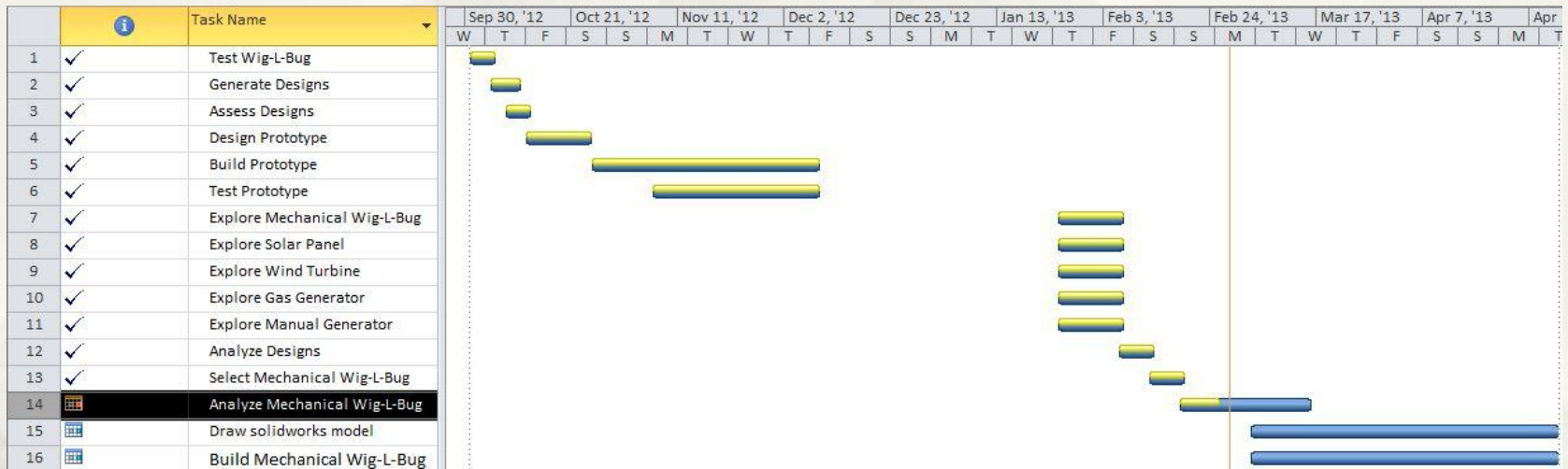
- Thread the end of the shaft
- Screw the handle on

Safety Factor

- Maximum allowable torque = 36 N·m
- Torque designed = 15 N·m
- Safety factor = 2.4



Gantt Chart



Conclusion

- **Wig-L-Bug Motion Analysis**
 - Convert rotational to reciprocating
- **Gearbox Design**
 - Gear
 - Shaft
 - Case
- **Crank Handle**
 - Installation
 - Safety factor

Questions ?

