 **Designing Machines**

**Introduction**

* Machines are designed to help make things easier for us to do;
* The can opener was patented in 1858 with little modification since then;
* Only electric designs are easier than the original patent.

**Machine Tasks**

* Machines meet a specific need or perform a task:
  + Transform energy;
  + Transfer forces from one place to another;
  + Change the direction of a force;
  + Change the magnitude of a force;
  + Increase or decrease speed.

**Machines As Systems**

* Machines are thought of as a system made up of subsystems;
* Each subsystem performs a different function;
* Subsystems are made up of mechanisms;
* Can opener has two subsystems: first is to pierce and cut metal, second is to rotate can.

**Machines and Controls**

* A system can only operate as a system if each subsystem performs its function;
* Control is the second requirement for a machine to operate;
* A can can be opened slowly or quickly;
* Lack of a good grip or if the opener gets stuck, then it must be taken off the can and reapplied.

**Conclusion**

* The human operator controls both the can opener and the movement of the can using the grip (the lever);
* One can change the magnitude of the force applied and by changing the point of application of the opener;
* Electric can openers must have their own internal controls and self-correcting controls;
* How does the system of a piano work?