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1 Sensors and actuators track different signals, operate through different means, and must work together to complete a task. Sensors in biomedical applications are used to gain the information on a body and pathology. The sensors are classified into 3 namely; Physical sensors (which measures blood pressure, body temperature, body pulse etc), Chemical sensors (measures the ingredients and concentration of body liquid such as pH value), and Biosensor (used to sense enzyme, RNA, DNA, microbes, etc).

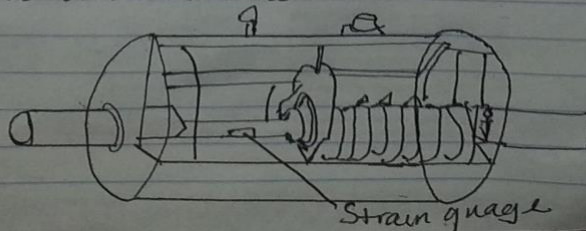
An actuator drives the events within the equipment. It takes an electrical signal and combines it with energy source to create physical motion i.e an electrical pulse may drive the functions of a motor within an asset.

Examples of Sensors / Actuators used for Biomedical Application includes;

- pH meter
- Pulse oscmometer
- Electrical thermometer
- Ultra Sound Machine.

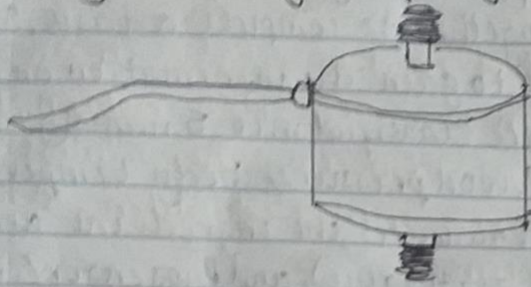
2 Torque transducer

It converts a torsional input into an electrical output signal. It converts torsion (surface shearing stress) corresponding to a torque of the shaft to an electric quantity (Voltage), and then output signals through slip rings, brush, rotatory transformer and photo-transmittance.



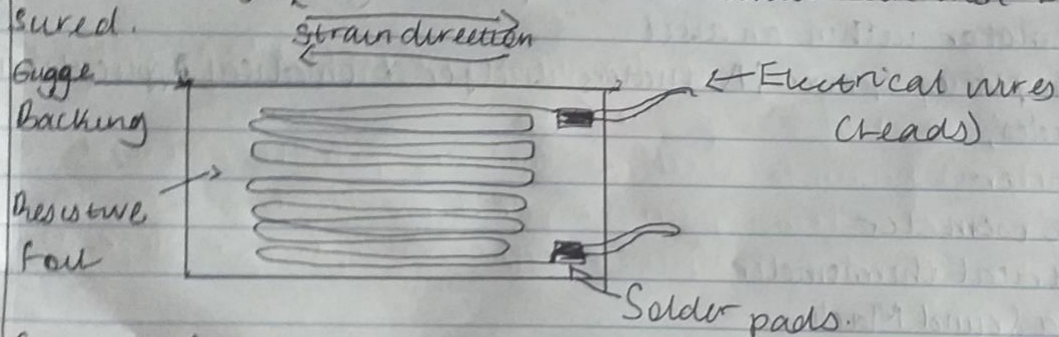
## b) Load cells

A load cell is a transducer which converts force into a measurable electrical output. It measures mechanical forces mainly the weight of objects.



## c) A strain gauge

A strain gauge is a sensor whose resistance varies with applied force. It converts force, pressure, tension, weight into a change in electrical resistance which can then be measured.



## 3) Cardiac Defibrillator.

The use of wearable cardioverter defibrillator (WCD) for interim protection is rapidly increasing.

A 51 year old female with coronary artery disease following prolonged hospitalization was fitted with a WCD during evaluation for an internal cardiac defibrillator. During inpatient rehabilitation, the therapy plan required unique considerations because of the presence of the WCD.

A cardiac defibrillator is a device implantable inside the body, able to perform cardioversion, defibrillation, and pacing of the heart. A defibrillator is used to prevent / correct an arrhythmia, a heartbeat that

is uneven or that is too slow or too fast.

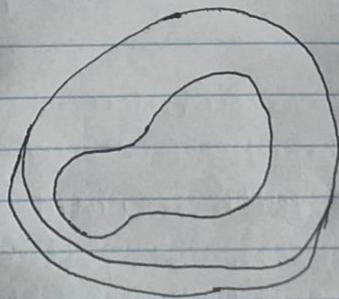
## b) Bedpan

### Case study:

A 69 years old man, was admitted to a hospital with an admittance diagnosis of digoxin toxicity, dehydration, renal insufficiency and a right heel ulcer. During the admission, the patient was weak and primarily bedridden so he had to use a bedpan for toileting.

A bedpan is a container used to collect urine & feces, and it is shaped to fit under a person lying or sitting in bed. It can be used with liners to prevent splashing and to make cleaning easy. There are two types of bedpans

- ) A fracture pan: It is designed for patients in casts and those who had a hip surgery.
- ) An embas basin is used for the rare female patient, who because of extreme pain or for a medical reason, should not be raised to bedpan height except for defecation.



-> Illustration of a bedpan.