i) Round shape receptor: This part of the stethoscope touches the chest of the patient to capture the chest's sound. It consists of a diaphragm and a bell.

The diaphragm is a flat metal disc surrounded by chill rings which enable it to pick a very high sound. It is at the lower part

The bell is the smaller part, made up of a hollow piece of metal which helps pick up low frequency sounds

ii) Tubing: This is a long tube made of PVC and latex rubber.

iii) Head set: This is the part responsible for transmission of the sound from the round shaped receptor to the listener's ears

iv) Binaural: These are metallic pieces that are inserted into the stethoscope tube which directly plays the role of transmitting the sound from the chest piece into the listener's ears

Whenever a medical practitioner places a stethoscope diaphragm on the chest of a patient, a vibration will occur at the flat surface of the stethoscope which is as a result of sound waves that is being generated from the patient's body. The vibration picked by the diaphragm is being patched externally in order to prevent sound loss and thereby channeled through the tube to a specific direction

Inside the tube, a multiple reflection tends to occurs as a result of wave collision with the wall of the tube. And this continues in succession until it reaches the ear tips at the other end of the device being picked by the listener's eardrum

is thus converted to linear distance signal. The capillary tube has the role of signal manipulation and data transportation elements. The final data presentation consists of the scale on the thermometer stem.

3a) Sphygmomanometer.

A sphygmomanometer is a device that measures blood pressure. It is composed of an inflatable rubber cuff, which is wrapped around the arm. ~~A measuring~~

As the heart beats, blood forced through the arteries causes a rise in pressure called the systolic pressure followed by a decrease in pressure as the heart is readying to prepare for another beat. This low pressure is called the diastolic pressure.

The sphygmomanometer cuff is inflated to well above the expected systolic pressure. As the valve is opened, cuff pressure decreases. When the cuff's pressure equals the arterial systolic pressure, blood begins to flow past the cuff creating ~~blood~~ flow turbulence and audible sounds. Using a stethoscope, these sounds are heard and the cuff's pressure is recorded.

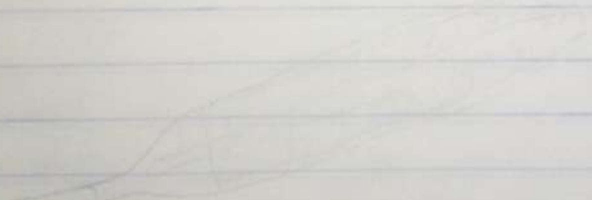
b) Stethoscope.

A stethoscope is a device normally used by medical practitioners to listen to sound that is coming or internally from human body or an animal and blood pressure in the veins and arteries. The structure of a typical stethoscope consists of a round shaped resonator or chest piece and a long tube. The tubes are connected to the ears while the resonator is placed on the chest to transmit the sound.

A typical stethoscope consists of:

a) Bourdon pressure gauge: The Bourdon tube acts as the primary sensing ~~measurement system~~ element. On account of the pressure, the closed end of ~~the quantity~~ Bourdon tube is displaced. Thus, the pressure is converted into a small displacement. The ~~mechanical linkage thus acts like~~ closed end of the Bourdon tube is connected through mechanical linkage to a sector - pinion arrangement. The gearing arrangement amplifies the small displacement and makes the pointer to rotate through a large angle. The mechanical linkage thus acts as a data transmission element while the gearing arrangement acts as a data transmission element while the gearing arrangement acts as a data manipulation elements. The dial scale on the gauge body plays the function of a data presentation element and conveys the information of the quantity being measured

b) Clinical thermometer:



The mercury acts as the primary sensing element as well as a variable conversion element. ~~It senses the~~ On account of the increase in temperature, the mercury bulb expands its ~~temperature~~ (volume) and its volume is increased. The temperature signal is converted to a volume ~~signal~~ displacement. As the mercury expands it moves through the capillary tube in the thermometer [illegible] attached to the bulb. ~~It~~ The volume signal

not suited to the measurment system

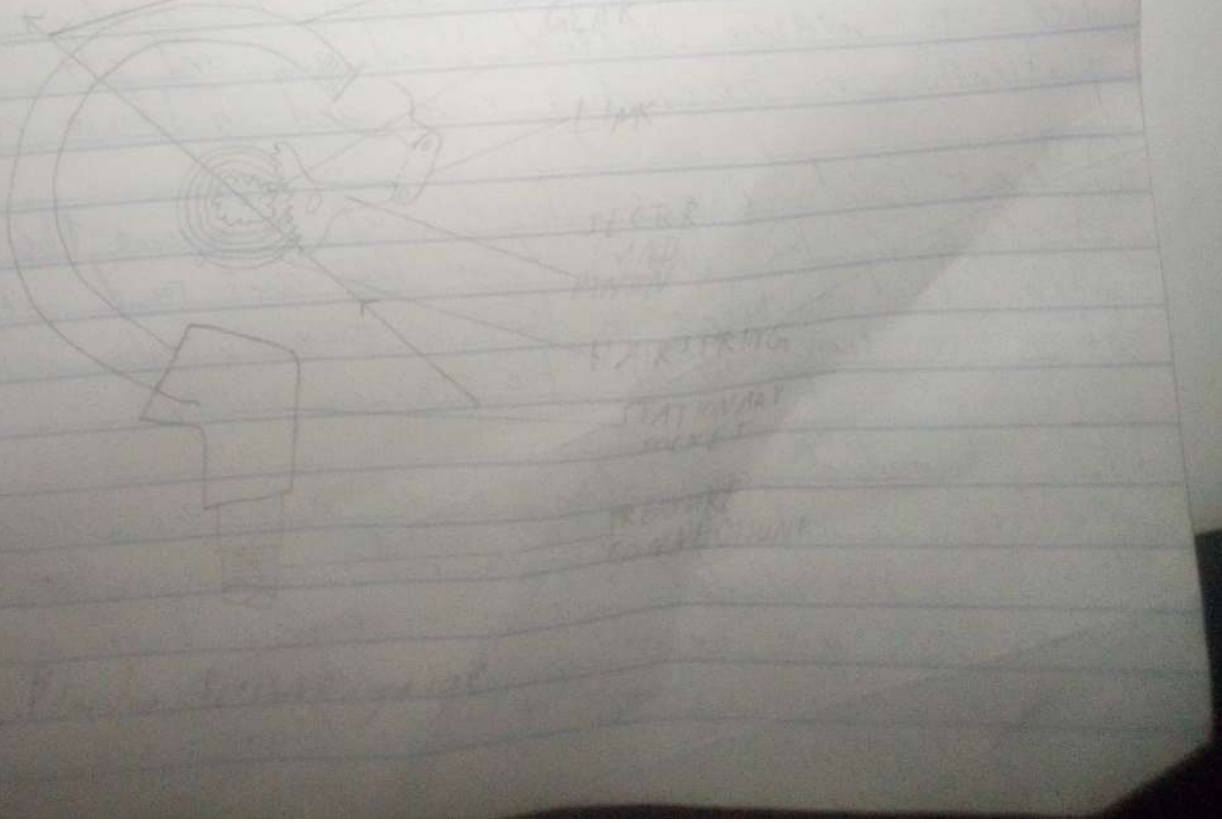
iii) Variable manipulation element: This manipulates the signal presented to this element while preserving the original nature of the signal

iv) Signal conditioning element: This removes signal contamination or distortion using signal conditioning processes.

v) Data transmission element: This transmits data from one element to another in cases where the elements of an instrument are physically separated.

vi) Data presentation element: This conveys the information about the quantity under measurment to the personnel handling the instrument for monitoring, control or analysis purposes.

Examples



of the electric motor into the motion of the rod. Recent technologies have made it possible to make this motion much more accurate and less power-consuming which has led to a decrease in the actuator's size. Since then, there has been a surge of new ways of using actuators in medical equipment

Examples

i) Prosthetic limbs. Simulating a natural movement of our limbs would be impossible without linear actuators. However, scientists and engineers have only recently come close to it, with the help of the smallest and most accurate actuators. Such devices require a high level of precision in their work, which makes it very difficult to find a suitable actuator for them.

ii) Scanners: CT, MRI and PT scanning instruments are used in hospitals, clinics and palliative care units for examination and diagnosis purposes. These scanners are powered with linear actuators which allow easy movement in any direction.

2a) Primary sensing element: The quantity which is being measured makes its first contact with the primary sensing element of a measurement system. The measurand is converted into an analogous electrical signal by a transducer.

b) Variable conversion element: This converts the output signal from the sensor to some other suitable form while preserving the information content of the original signal. This occurs when the output from the sensor

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18/ENG02/068
Chinemso Ogan
Computer Engineering

Sensors for biomedical applications sense biomaterial and its concentration and converts the biosignal into electrical signal. They have the function of acceptor and converter.

In biosensors, the physiochemical change of the biologically active material resulting from the interaction with the analyte must be converted into an electrical output signal by an appropriate converter.
Biosensors' sensing components mainly have enzymes, cells, and bodies, DNA, chemical electrode, microbe and other biologically active agents in analytical devices. In the course of detecting the parameters of analytes, biomaterial should always be mobile. In order to develop biosensors, some biotechnology has to be studied and applied.

Examples of Biomedical sensors
i) Oxygen and carbon dioxide sensors for blood: These are used to measure arterial blood gas and pH of critical patients in operating rooms and in intensive care units

ii) Heart sound sensors: This is used to measure the expansion and shrinkage of the heart from the heart sound which occurs when blood turbulence in the vein forms vibration in the artery which is transported to the thoracic cavity

For biomedical applications linear actuators are used. Most of them convert the circular motions of a motor into the linear motion needed. Linear actuators that work on electricity are based on the same principle, with the help of a screw it transforms a circular motion