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(3) Pipette

A pipette (sometimes spelled pipet) is a laboratory tool commonly used in chemistry, biology and medicine to transport a measured volume of liquid, often as a media dispenser. Pipettes come in several designs for various purposes with differing levels of accuracy and precision, from single piece glass pipettes to more complex adjustable or electronic pipettes. Many pipette types work by creating a partial vacuum above the liquid-holding chamber and selectively releasing this vacuum to draw up and dispense liquid. Measurement accuracy varies greatly depending on the instrument.

E.g. are: - Air displacement micropipettes.

Electronic pipettes.

Positive displacement pipette.

Volumetric pipette.

Graduated pipettes.

Transfer pipettes.

(ii) Sphygmomanometer

A sphygmomanometer, also known as a blood pressure monitor, or blood pressure gauge, is a device used to measure blood pressure, composed of an inflatable cuff to collapse and then release the artery under the cuff in a controlled manner, and a mercury or aneroid manometer to measure the pressure. Manual sphygmomanometers are used with a stethoscope when using the auscultatory technique.

~~A sphygmomanometer consists of an inflatable~~

There are 2 types of Sphygmomanometer and they are -

(i) Manual

(ii) Digital.

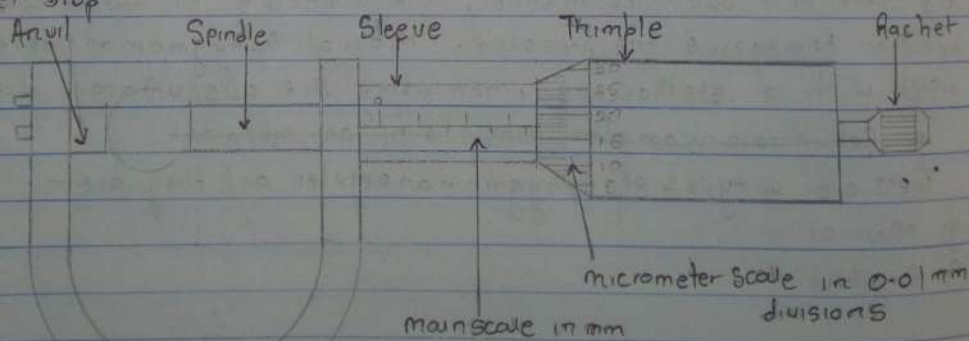
② Micrometer Screw Gauge.

A micrometer, sometimes known as a micrometer screw gauge, is a device incorporating a calibrated screw widely used for accurate measurement of components in mechanical engineering and machining as well as most mechanical trades along with other metrological instruments such as dial, Vernier, and digital calipers. Micrometers are usually, but not always, in the form of calipers (opposing ends joined by a frame). The spindle is a very accurately machined screw and the object to be measured is placed between the spindle and the anvil. The spindle is moved by turning the ratchet knob or thimble until the object to be measured is lightly touched by both the spindle and the anvil.

Micrometers are also used in telescopes or microscopes to measure the apparent diameter of celestial bodies or microscopic objects.

- Components

- (i) Frame
- (ii) Anvil
- (iii) Sleeve, barrel, or stock
- (iv) Lock nut, lock-ring, or thimble lock
- (v) Screw
- (vi) Spindle
- (vii) Thimble
- (viii) Ratchet stop



Micrometer Screw Gauge

① In the biomedical field, when performing surgery on different very small parts of the human body, the doctor would in the past have followed a habitual process of which the accuracy of the results could be very low. Recent advancements in technology have meant that the accuracy of these procedures has improved with the help of smart actuators and smart sensors. Different types of smart actuators are used according to the requirement and type of actuator needed. The smart actuators are fabricated with the use of the MEMS (Micro Electrical Mechanical Systems), which is a technology that would seem to be propitious for the future of the biomedical field. MEMS comprise microscale devices that merge mechanical and electrical elements.

- Smart Actuators

Smart actuators may be defined as the integration of various elements such as sensors, processors and communicators within an actuator element that then allows for the subsequent integration of the actuator inside the complete system. Smart actuators utilize as a part of biomedical field can be characterized as actuators which are fit for changing over different types of energy, for example, physical energy into mechanical work in response to different natural stimuli such as pH, heat moisture or humidity, electric or magnetic field. Smart actuators which are being used ~~for magnetic field~~ in biomedical field can be defined as actuators which are fit in changing over different types of energy. Currently there are a number of different smart actuators that are low noise and exceedingly proficient as muscles and can be incorporated with delicate automated frameworks such as soft robotics. Nitinol, which is a shape-memory alloy, is the most well known artificial muscle materials and it can change its shape with temperature, which can provide actuation. It is mostly used in the form of wire and the actuation is achieved through the process of heating which is done by passing a current through it.

This type of actuator is classed as an electroactive polymer and is also known as an electroactive polymer (EAP). This group can

be further divided into 2 categories

- i) Ionic ERP.
- ii) Electronic ERP.

- Smart Sensors

The proposition for the use of Silicon for medical application has existed for almost 4 decades now. Since then, Silicon has been used in diff. forms for a range of in-vitro and in-vivo applications. The diff. forms of silicon ~~use~~ have been mechanically and electrically enhanced via microfabrication technologies. For the last three decades, Silicon-based sensors can be found in applications in industry and medicine.

Furthermore, the combination of silicon ~~base~~ technology with information and communication technologies enabled the development of compact, low-cost and high-~~perform~~ high performance devices for different applications.

Nowadays, biological and biomedical Silicon-based technology has exhibited a remarkable potential in the application field, from a research point of view as well as industrial perspective.

We have the following sensors

- i) Planar sensors
- ii) Polysilicon-based sensors
- iii) D printed and optical sensors
- iv) Piezoresistive sensors
- v) Silicon Nanowires. etc.