



ROHINI

COLLEGE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF BIOMEDICAL ENGINEERING

III Semester

BM3301 SENSORS AND MEASUREMENTS

UNIT – 5

5.4 PMMC Writing Systems

The D'Arsonval movement used in moving coil indicating instruments can also provide the movement in a Galvanometer/PMMC Type Recorder. The D'Arsonval movement consists of a moving coil placed in a strong magnetic field, as shown in Fig. 5.4.1.

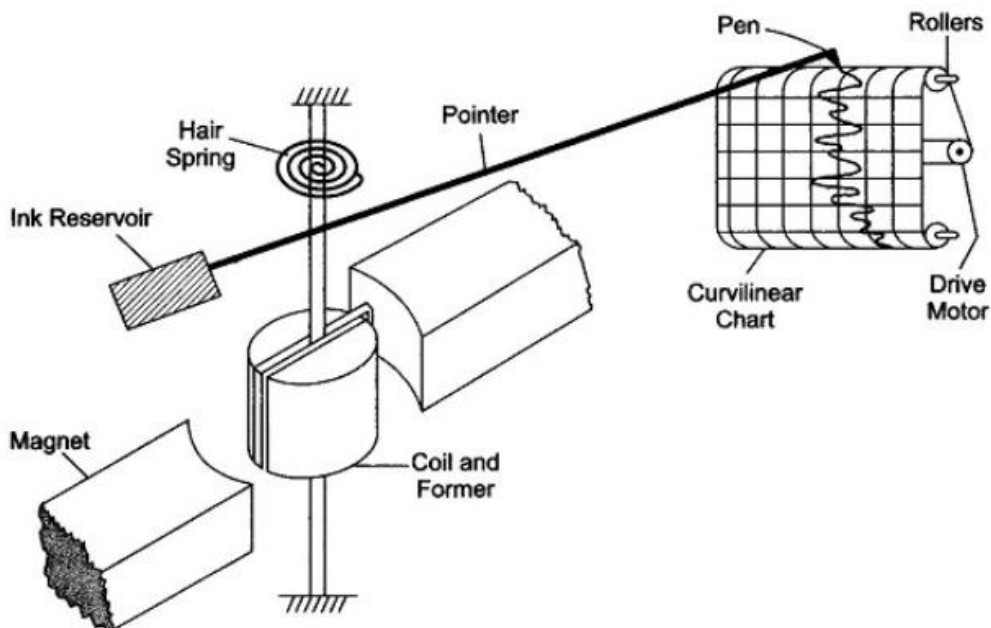


Fig 5.4.1 PMMC type writing system

Construction and working:

1. In a galvanometer type recorder, the pointer of the D'Arsonval movement is fitted with a pen-ink (stylus) mechanism.
2. The pointer deflects when current flows through the moving coil. The deflection of the pointer is directly proportional to the magnitude of the current flowing through the coil.
3. As the signal current flows through the coil, the magnetic field of the coil varies in intensity in accordance with the signal.
4. The reaction of this field with the field of the permanent magnet causes the coil to change its angular position. As the position of the coil follows the variation of the signal current being recorded, the pen is accordingly deflected across the paper chart.
5. The paper is pulled from a supply roll by a motor driven transport mechanism. Thus, as the paper moves past the pen and as the pen is deflected, the signal waveform is traced on the paper.
6. The recording pen is connected to an ink reservoir through a narrow bore tube. Gravity and capillary action establish a flow of ink from the reservoir through the tubing and into the hollow of the pen.
7. PMMC type recorders are well suited for low frequency ac inputs obtained from quantities varying slowly at frequencies of upto 100 c/s, or in special cases up to 1000 c/s.
8. Because of the compact nature of the galvanometer unit (or pen motor) this type of recorder is particularly suitable for multiple channel operation. Hence it finds extensive use in the simultaneous recording of a large number of varying transducers outputs.
9. In one of the recorders, the paper used is usually heat sensitive, and the stylus is equipped with a heated tip long enough to guarantee a hot point of contact with the paper, regardless of the stylus position on the chart.

10. Alternatively the paper can be electrically sensitive, in which case the stylus tip would serve to carry current into the paper at the point of contact.

The recorders can work on ranges from a few mA/mV to several mA/mV. These permanent magnets moving coil type recorders are comparatively inexpensive instruments, having a narrow bandwidth of 0 – 10 Hz. They have a sensitivity of about 0.4 V/mm, or from a chart of 100 mm width a full scale deflection of 40 mV is obtained.

Writing Methods:

Direct Contact method:

- The direct contact uses a special types of chart paper that is chemically treated to have a carbonized back.
- When a pressure applied to that front of the paper a black mark will appear.
- Most of these instruments have a frequency response of less than 25 Hz and so are not commonly used in medical instrumentation.

Optical Recording:

- There are two types of optical recorder
- PMMC type uses small inertia mirror in place of the pen assembly or stylus.
- The other uses a photographic paper that is pulled across a cathode ray tube and is called a CRT camera recorder.
- Most of these recorders use wide paper.
- On multichannel optical recorder it is possible to examine the time relationships between different traces more easily because the traces can be allowed to overlap each other.
- The paper in the optical recorder is often develop by exposure to an ultraviolet lamp as the paper comes out from the recorder.

The thermal recorder:

- The thermal recorder also uses special paper, but in this case, it is waxed or treated with paraffin so that it will turn black when treated
- The thermal recorder is the most commonly employed in medical instrumentation, especially in cardiovascular instruments such as the ECG and pressure monitors

- The stylus in a thermal system is little more than a heated resistance wire connected to a low voltage ac or dc power supply.
- Early models formed a U-shaped electrical resistance element
- Modern models use a wire inside a cylindrical metal stylus
- In both cases a low voltage electrical power supply energizes the element, causing the tip to become heated.
- The black mark is made at the points where heated stylus touches the paper

Applications:

The applications of this include the following.

- i. It is used to detect the flow of the current's direction within the circuit & also determines the null point.
- ii. It is used to determine the current.
- iii. By using this we can determine the voltage between two points.
- iv. They are used in control systems, laser engraving, laser TVs, laser sintering, laser displays, etc.
- v. They are used in the CD/DVD players & hard drives for controlling the position of head servos.
- vi. They are used in a film camera to get the readings of photoresistor in the metering mechanisms
