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Mechanical Counting Devices: An Overview

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ABSTRACT:Mechanical counters are counters built using mechanical components. Long before the introduction to electronics and electronic components, mechanical devices were used to count events. They consist of a series of gear disks mounted on axle, with the digits zero to nine marked on their edges or circular periphery. One end of the disk moves one increment with each event. Every disk except the left-most has a protrusion that, after completion of one revolution, it moves the next disk to the left one increment. Such counters are and were used as odometers for bicycles and cars and in tape recorders and fuel dispensers and also to control manufacturing processes. This Article is a compilation of introduction to such counting devices so that the reader gets a compact knowledge about these devices altogether.

KEYWORDS:ABACUS, mechatronics, mechanical, ZAMAK, lever, spring, gear, wheel, LCD.

I. INTRODUCTION

The early counting devices can be defined as the devices used to perform arithmetic operations before the start of modern civilization. Human learned how to count and perform arithmetic operations long ago in the Stone Age. During this period, there was no complex calculative activity. People would add, subtract, multiply, and divide simple numbers or integers. So it can be inferred that numerical operations were not as hard and complex as today.

As the result, simple devices were used in performing these simple arithmetic operations. Some of the best examples of these counting techniques still in existence are the tally marking technique and the ABACUS.

In our day to day life, people are taught basic arithmetic operations using these old counting devices. But some of them have been modified and modernized to suit the present-day modernized and industrial system. In modern era, these early counting devices have been transformed into counters. With these devices, people can easily record the number of the events such as noting number of cycles, revolutions in unit time, etc. It can be hence said that the early counting devices have not gone into complete extinction. They have been transformed into a new system mechanical, mechatronical or electronical.

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LEVER VOTING MACHINE

Fig 1. Lever Voting Machine

Fig 2. Automatic Voting Machine

The lever voting machine was invented by John B. Myers to make voting process more efficient, faster, more accurate, and more honest. It was first used in Lockport, New York in 1892. At that time, the integrity of the vote was sometimes called into question because election officials sometimes tore or mark a ballot to make it invalid, or also stuff the ballot boxes with additional votes, or throw the entire ballot box into the water or burn them. There was a real need for a new voting system, and the lever machine was a really high-tech solution of its time.

To use a lever voting machine, voters pulled a large handle like lever, which closed the machine's curtains to ensure a secret ballot and to unlock the machine. Voters used to see a board with electoral candidate's name and party symbol arranged in rows, with small levers above the choices. Once a voter clicked or pushed the lever downwards, the machine used to get locked to prevent a duplicate vote. The Voter then pulled back the large handle to reopen the curtains before him. This resetted the small levers and caused a device like the odometer in the machine to turn, casting an one single vote for each candidate. The machine was after that locked again until and unless the next voter started the process all over again.

ODOMETER

An odometer is an instrument used for the measurement of the distance travelled by a vehicle, such as a bicycle, motorcycle or car. The device can be mechanical, electronic or mechatronical.

Mechanical odometers usually are turned by flexible cable made from a compact and tightly winded spring. The flexible cables spins inside a metal tube protected with a rubber housing. A little wheel on the bicycle rolling against the bike's wheel turns that flexible cable, and gear ratio on the odometer is calibrated to the size of this small wheel. For a car, the gear engages the output shaft of the transmission, turning that flexible cable. The cable winds its way to the instrument panel, where it is joined to the input shaft of the odometer.

The odometer uses a series of worm gears to achieve its gear reduction ratio. The input shaft is responsible to drive the first worm gear, which drives a gear. Each complete revolution of the worm only turns the gear by one tooth. That gear turns another worm, which in turn turns another gear, which turns the last worm and finally the last gear is turned, it is hooked up to the tenth-of-a-mile indicator.

Each indicator has a row of pegs out of one side, and also a single set of two pegs out on the other side. When these set of two pegs comes around to the adjoint gears, one of the teeth falls in between the pegs and turns with the indicator until all the pegs pass. This gear also does engages one of the pegs on the next bigger indicator, responsible for turning it a tenth of a revolution.

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Fig 3. Worm gear positioning in odometer

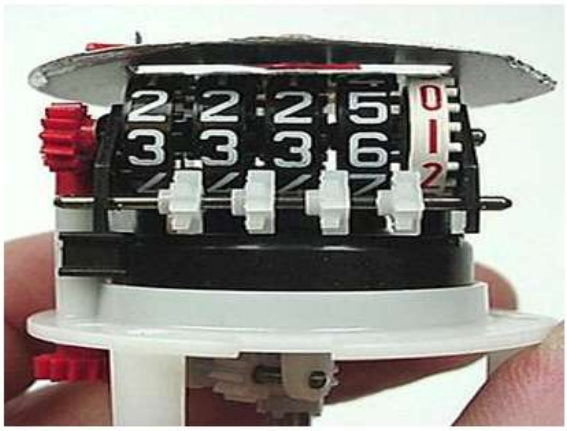

Fig 4. Mechanical Odometer

TALLY COUNTERS

Tally counters are mechanical, electronic, or software devices used for incrementally counting something, typically fleeting. One of the major common things tally counters are being used for is counting people, animals, or things that are coming and going from certain location.

Tally Counters are usually cased in metal and are cylindrical in look or shape. Part of the circle is stressed or flattened out and is containing a window of plastic or glass. Inside of these counters are a number of rings with the numbers starting from 0 to 9 in descending order going in clockwise direction. Most of the counters have four such rings, allowing the user to count things up to 9999. A metal made ring may be attached to help in holding the counter, and usually half of that ring is bent to allow it to fold flush with the tally counter when not in use.

The counter is usually activated by pressing a button located above of the screen. This makes the first ring to advance one number and after the count has reached 0009, then the second ring will go forward by one click and the first ring will come back to zero displaying 0010. For resetting the counter, a knob is provided on the side. This knob turns all of the rings which are displayed in the same number usually zero. When the numbers that are displayed reaches the number on the remaining rings, then they will turn until the display is reset back to 0000. Analog odometers in use usually in vehicles operate in a similar fashion.

Electronical tally counters are also available, which uses the LCD screen to display the number of count, and also a button to advance that count. Some also have a button to decrement or decrease the count, for example if a mistake is done, or if counting is done for a majority.

Fig 5. Tally Counter

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TOTALIZING COUNTERS

Totalizing Counters are counters that summate the number of cycles applied to their input. The totalizing functions do not provide the control outputs or already preset limits, but some of these multi-function products also have the totalizing ability as well as they have output and control functions. They may be of mechanical nature, electromechanical or electronic nature counters, all of which may be either resettable or non-resettable.

Fig 6. Veeder root totalizer

Mechanical totalizing counters usually use imprinted wheels or drums to display the exact count value, and are actuated by the external force on the lever or shaft in a linear, reciprocating or rotating action. Mechanical totalizers are very robust in their making and construction and are often seen in severe and harsh environments which can result in destruction of other types of counters.

A mechanical totalizing counter can also be used as a yardage counter for sheet fabric, upholstery etc. in a factory or any other commercial setting.

STROKE COUNTER

Stroke Counters are similar to the totalizers as they also usually count the number of the cycles or strokes happening in a system input. The heavy-duty design of the ratchet/stroke counter makes it ideal for most mechanical counting applications. Typical applications include tooling machines, winding machine, automatic and automation machines, presses, shear application machines, printing press machines, etc.

The mechanical stroke counters is usually a 5-digit counter with longer durability and lower cost. These counters are made of a die-cast ZAMAK which is an alloy of zinc, aluminium, magnesium and copper. So, it has a ZAMAK body and an ABS plastic face. Internally it also consists of metal kinematics motion devices. It generally has a reset lever, which nullifies or zeroes the counter by pulling the lever

Fig 6. Stroke Counter

CONCLUSION:-

Mechanical Counters have been really helpful in the industrial applications. These various Mechanical counting devices have variety of application and uses in various places. Some are modified to do a greater task. Some measure distances, while some measure cycles, rotations, revolutions etc. The innovation and invention of

such devices have really been the best boon for the human development and scientific advancements.

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REFERENCES:-

[1]. https://www.veeder.com/us/
[2]. Sleeswyk, Andre, Vitruvius' odometer, Scientific American, vol. 252, no. 4, pages 188-200 (October 1981)
[3]. "Benjamin Franklin and His Inventions". learn.fi.edu.
[4]. Bellis, Mary (2019-04-06). "The History of the Odometer". ThoughtCo.
[5]. https://www.skantnco.com/counters.php