

SERVO MOTOR

What is servo motor ?

This is nothing but a simple electrical motor, controlled with the help of servomechanism (a typical closed loop feedback control system). Servo motors are used where rotation of the motor is required for just a certain angle not continuously for long period of time. e.g. In toy cars, for moving tray of DVD player, etc.

Working Principle

Here instead of controlling a device by applying variable input signal, the device is controlled by a feedback signal generated by comparing output signal and reference input signal.

In a servo unit, you will find a small DC motor, a potentiometer, gear arrangement and an intelligent circuitry. The intelligent circuitry along with the potentiometer makes the servo to rotate according to our wishes.

The gear mechanism will take high input speed of the motor (fast) and at the output, we will get a output speed which is slower than original input speed but more practical and widely applicable.

Error detector is given output port of the potentiometer and electrical signal electrical signal as inputs. It amplifies the difference between both and feeds the DC motor.

As the motor shaft progresses the potentiometer knob also rotates. As the angular position of the potentiometer knob progresses the output or feedback signal increases. After desired angular position of motor shaft the electrical signal generated in the potentiometer becomes same as of external electrical signal given to amplifier.

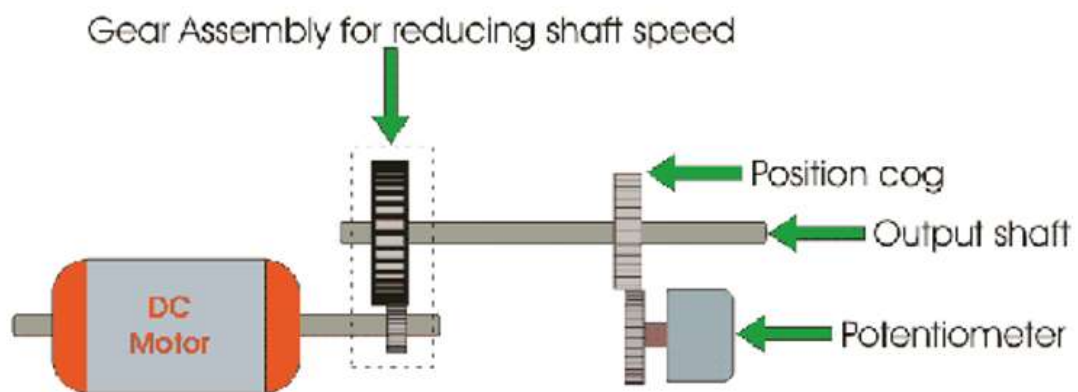
At this condition, there will be no output signal from the amplifier to the motor input as there is no difference between external applied signal and the signal generated at potentiometer. As the input signal to the motor is nil at that position, the motor stops rotating.

Servo Motor Control

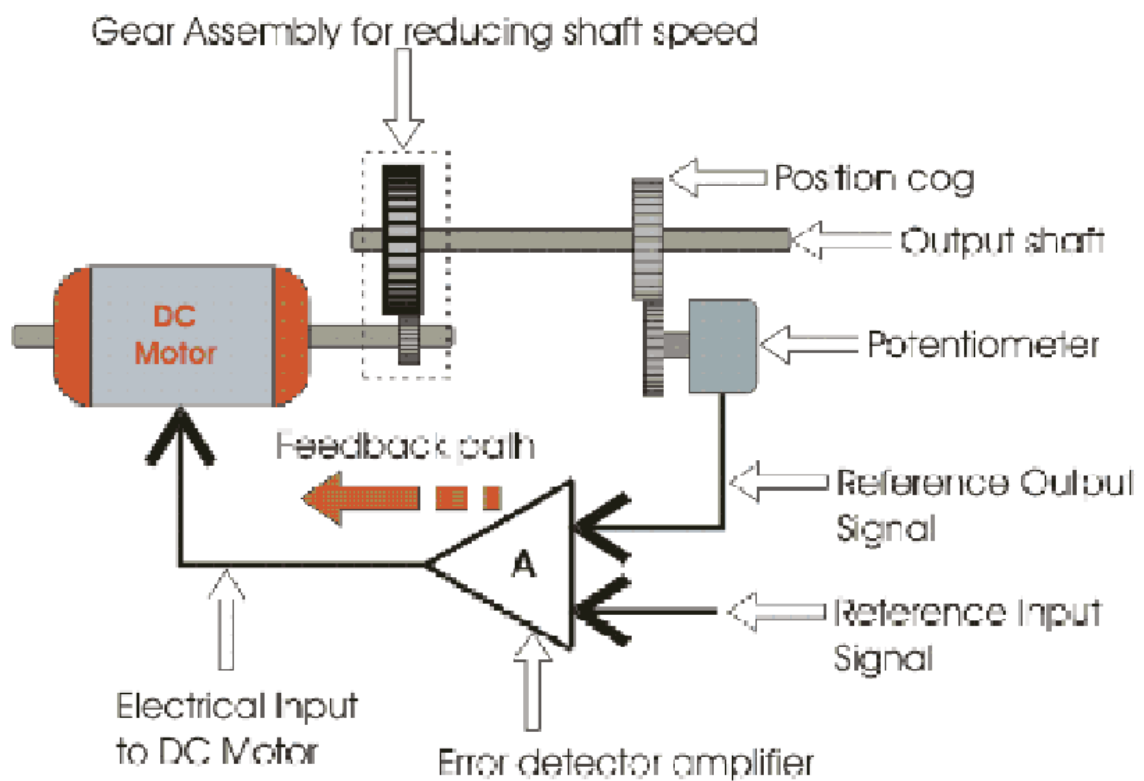
Let us consider an example of servomotor that we have given a signal to rotate by an angle of 45° and then stop and wait for further instruction.

The voltage adjusting knob of a potentiometer is so arranged with the output shaft by means of another gear assembly, that during rotation of the shaft, the knob also rotates and creates an varying electrical potential according to the principle of potentiometer.

This electrical potential or voltage is taken to the error detector feedback amplifier along with the input reference command i.e. input signal voltage.



As the angle of rotation of the shaft increases from 0° to 45° the voltage from potentiometer increases. At 45° this voltage reaches to a value which is equal to the given input command voltage to the system and the output voltage of the amplifier becomes zero. And so the motor stops.



The motor will be at this rest position until another command is given to the system for further movement of the shaft in desired direction.

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