SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35.

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai.

DEPARTMENT OF AUTOMOBILE ENGINEERING

COURSE NAME : 23AUT101 – ELEMENTS OF AUTOMOTIVE SYSTEM

I YEAR /II SEMESTER

Unit 2 Steering System

Topic : Power Steering

Power steering

- **Power steering** helps drivers steer vehicles by increasing steering effort of the steering wheel.
- **Hydraulic or electric actuators** add controlled energy to the steering mechanism
- The driver needs to provide only slight effort regardless of conditions.
- Power steering helps considerably when a vehicle is **stopped or moving slowly**.
- Power steering provides some feedback of forces acting on the front wheels to give an ongoing sense of how the wheels are interacting with the road; this is typically called "**road feel**"·

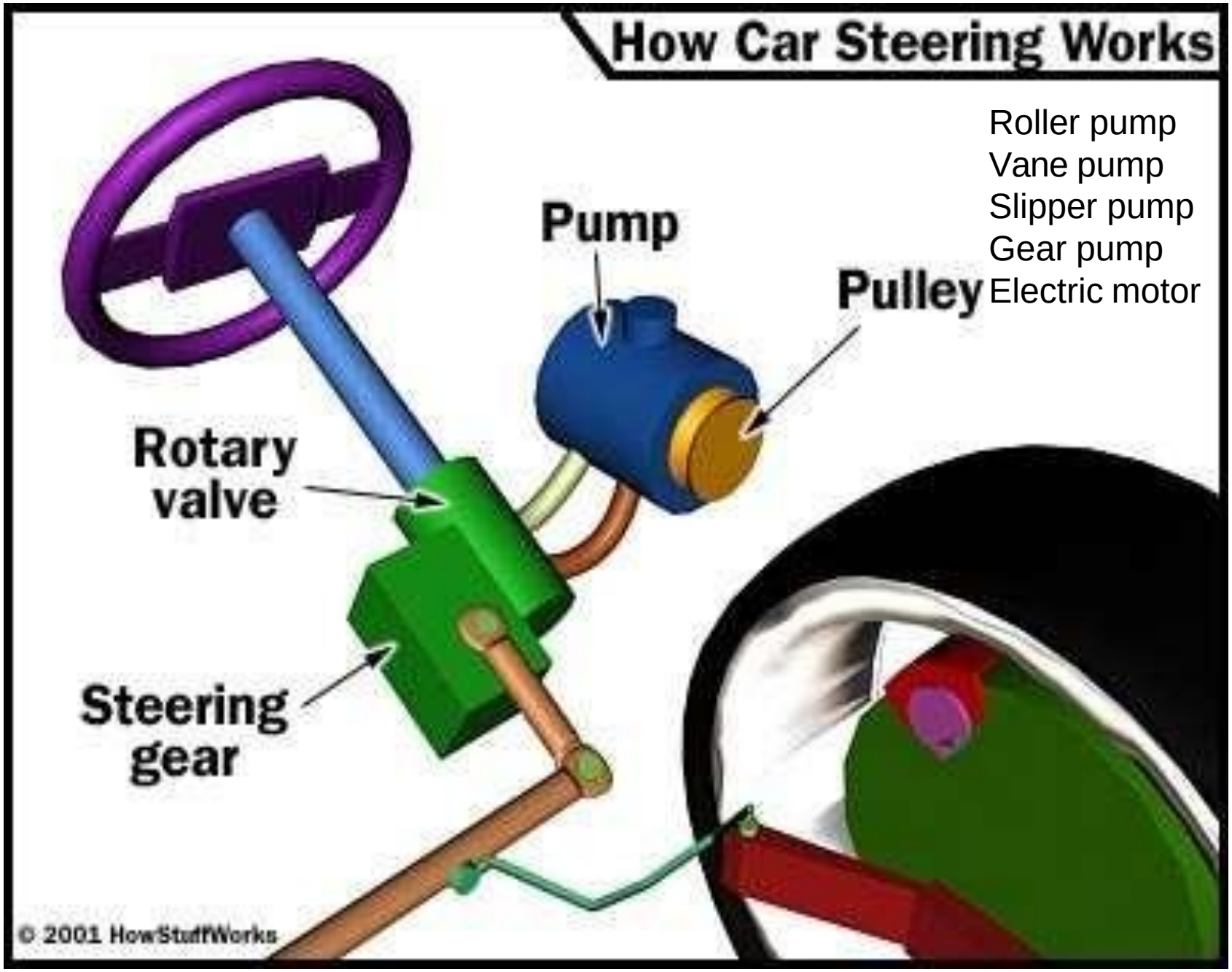
- **Part Time-Power steering**
  - The force of the center springs of the valve gives the driver the “feel” of the road at the steering wheel.
- **Full Time-Power steering**
  - The valve is installed without centering springs. Any movement of the steering wheel results in hydraulic boost being applied.

Hydraulic Power Assist

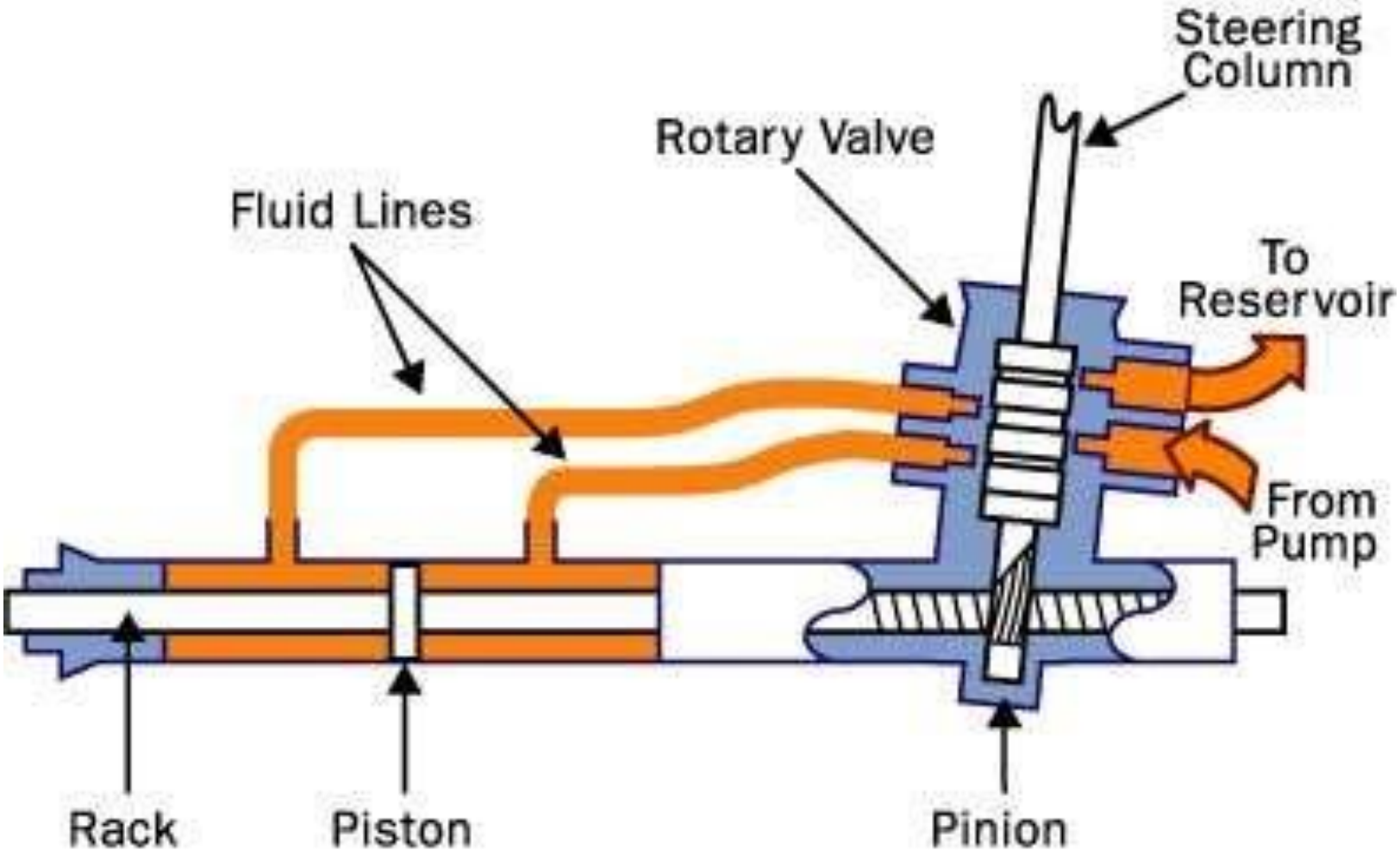
- Hydraulic power assist means that a hydraulic system is incorporated with mechanical steering
- This is the type of power steering used on most on-highway vehicles

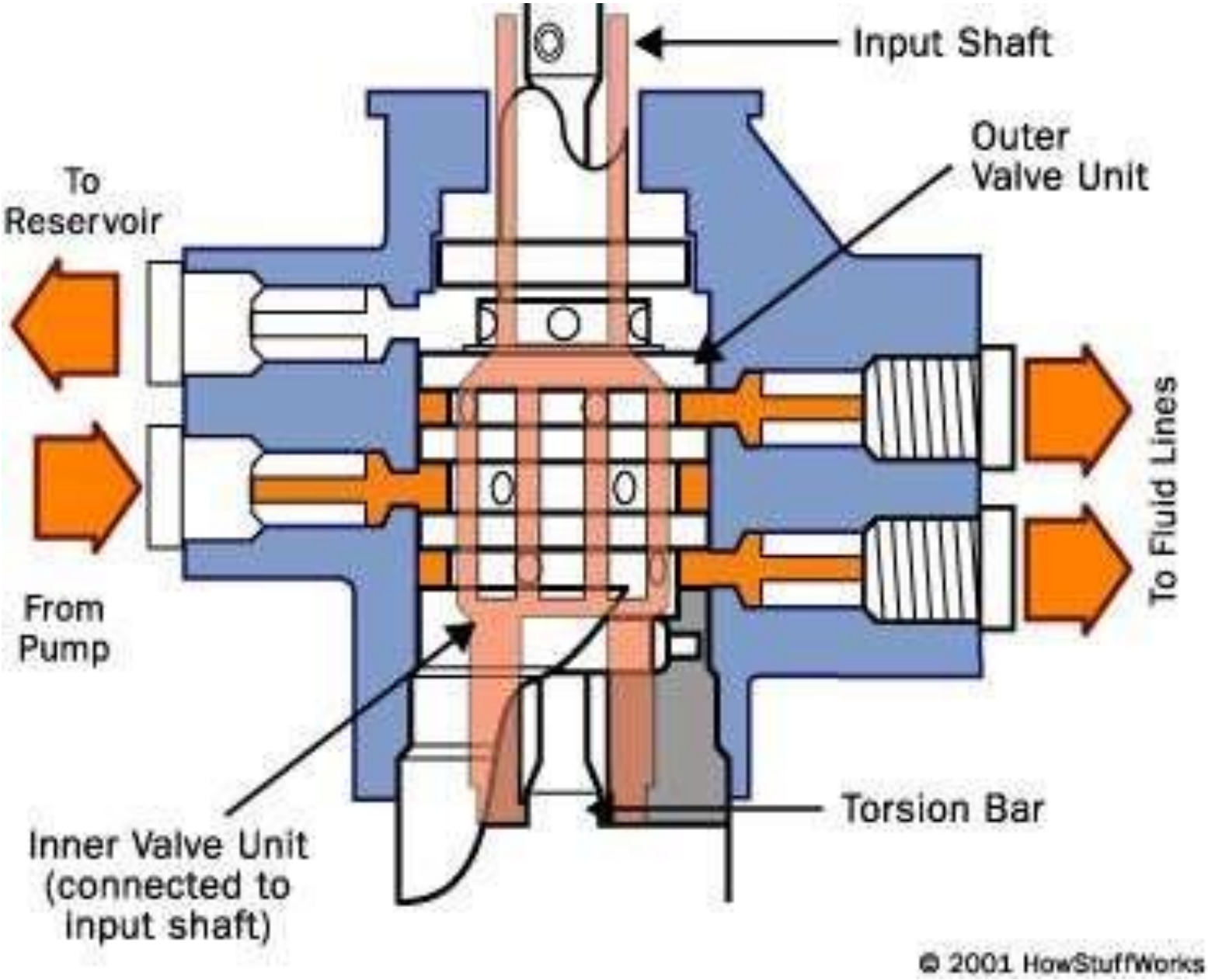
Components in Hydraulic power assist

Pump, Rotary or Control valve mechanism, Power cylinder, Power piston.

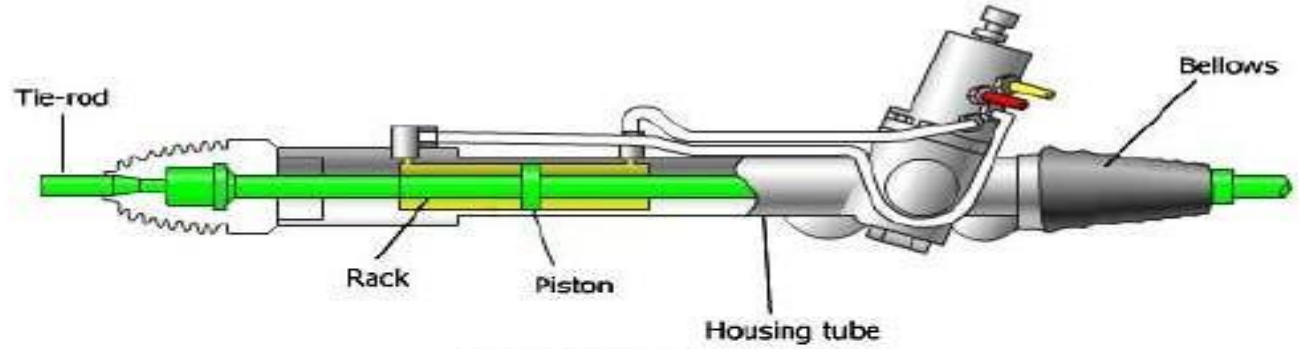


Roller pump
Vane pump
Slipper pump
Gear pump
Electric motor pump

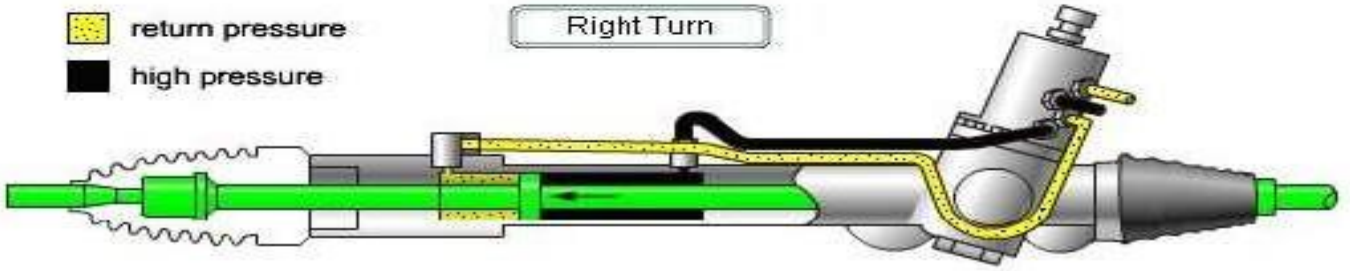

Steering Column
Rotary Valve
Fluid Lines
To Reservoir
From Pump
Rack
Piston
Pinion
©2001 HowStuffWorks

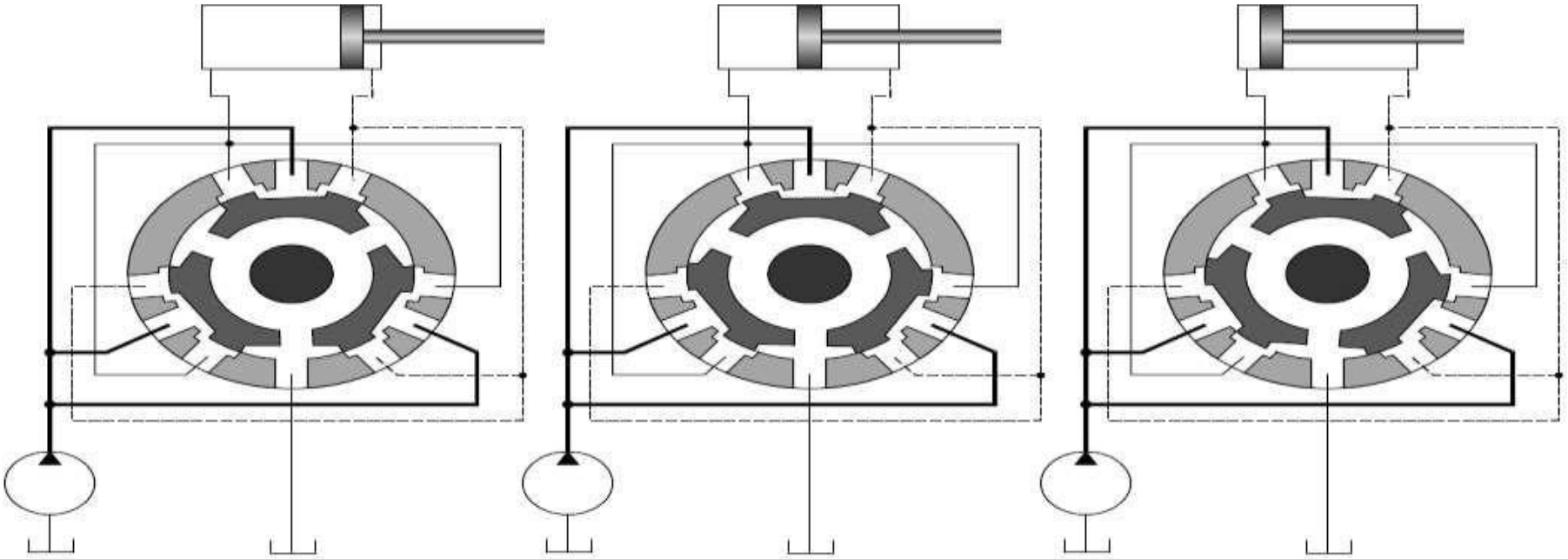


The device that senses the force on the steering wheel is called the rotary valve.



Power Rack-and-pinion





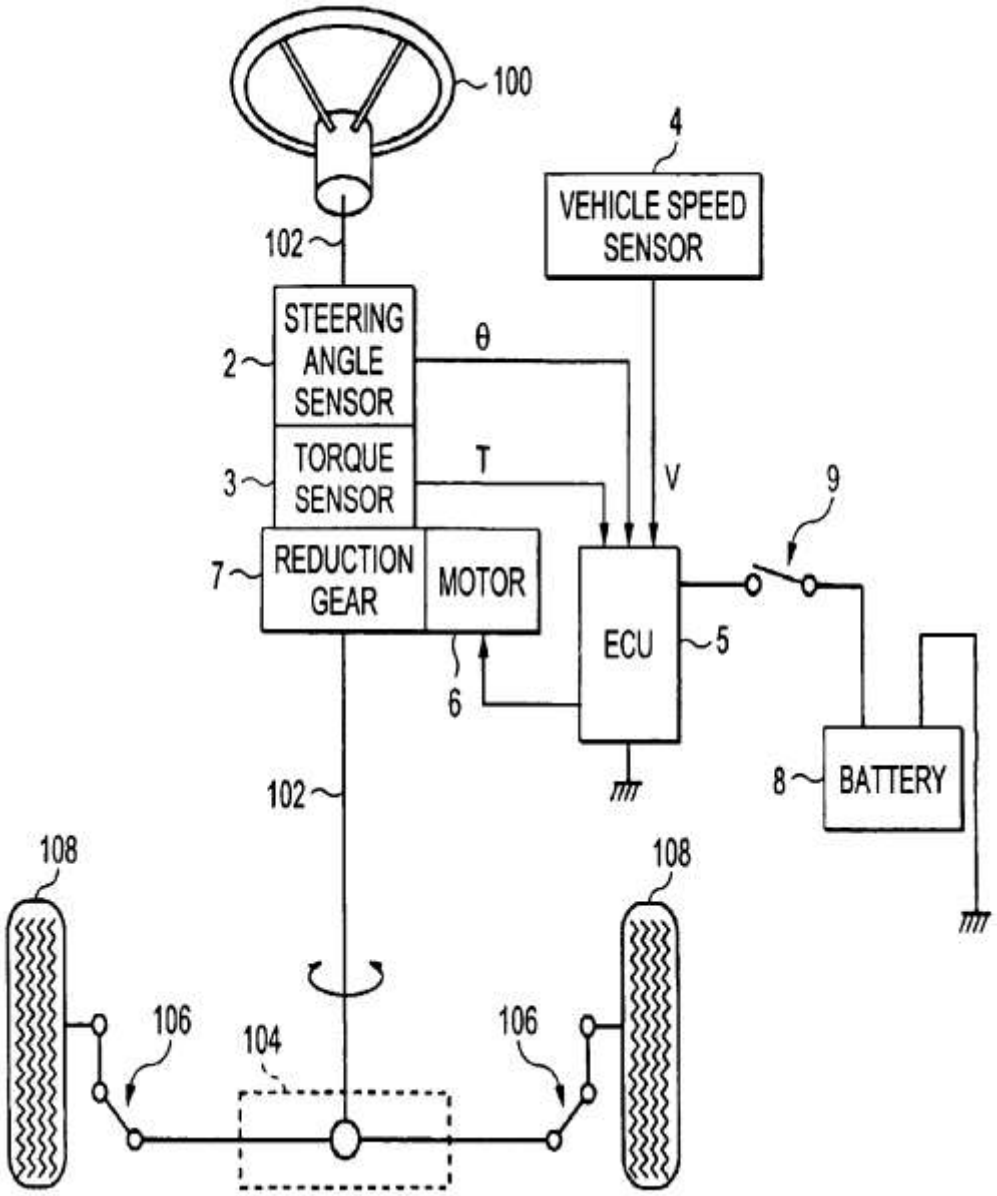
Electric Power Steering (EPS)

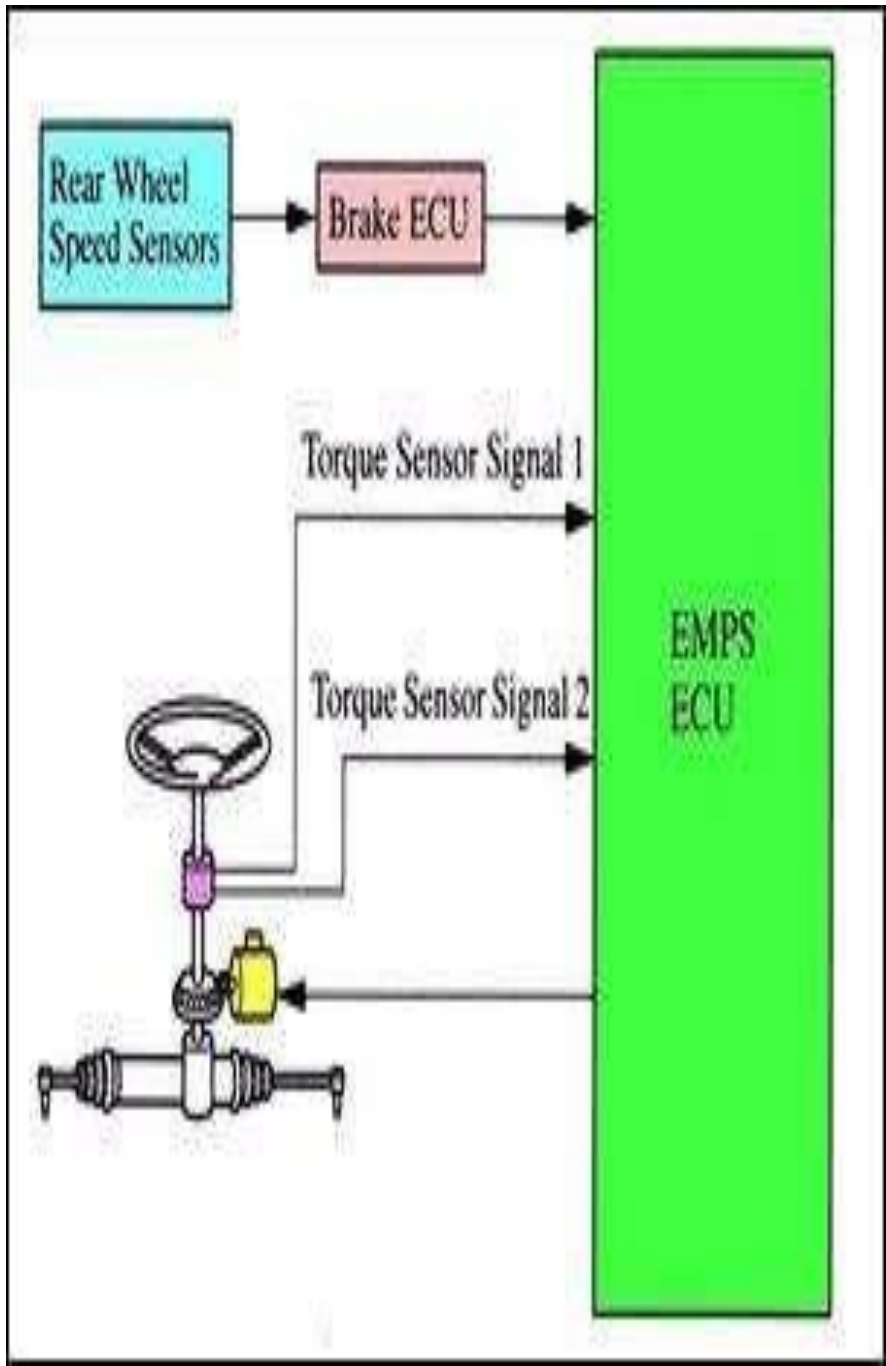
EPS technology, which replaces the traditional hydraulic-assist power steering pump with an electric motor.

This increases fuel economy because the electric motor operates only when steering assistance is required. EPS is powered by 12V motor and is not depend upon the engine power. Its work engine is shutdown.

Components

Torque sensor, ECU , Sensor and Motor.


100
4
VEHICLE SPEED SENSOR
102
STEERING ANGLE SENSOR
2
θ
TORQUE SENSOR
3
T
V
9
REDUCTION GEAR
7
MOTOR
ECU
5
6
8
BATTERY
102
108
108
106
104
106


Rear Wheel Speed Sensors
Brake ECU
Torque Sensor Signal 1
Torque Sensor Signal 2
EMPS ECU

DC Motor The DC motor uses a worm gear to transmit the motor's torque to the column shaft.

Reduction Mechanism The reduction mechanism transmits motor power assist to the pinion shaft. The reduction mechanism consists of the ring gear that is secured to the pinion shaft and the pinion gear that is integrated with the motor shaft. The power assist of the motor is transmitted by the reduction mechanism to the pinion shaft which provides power assist to the steering effort.

Torque Sensor The torque sensor detects the twist of the torsion bar and converts the applied torque into an electrical signal. The EPS ECU uses that signal to calculate the amount of power assist the DC motor should provide.