

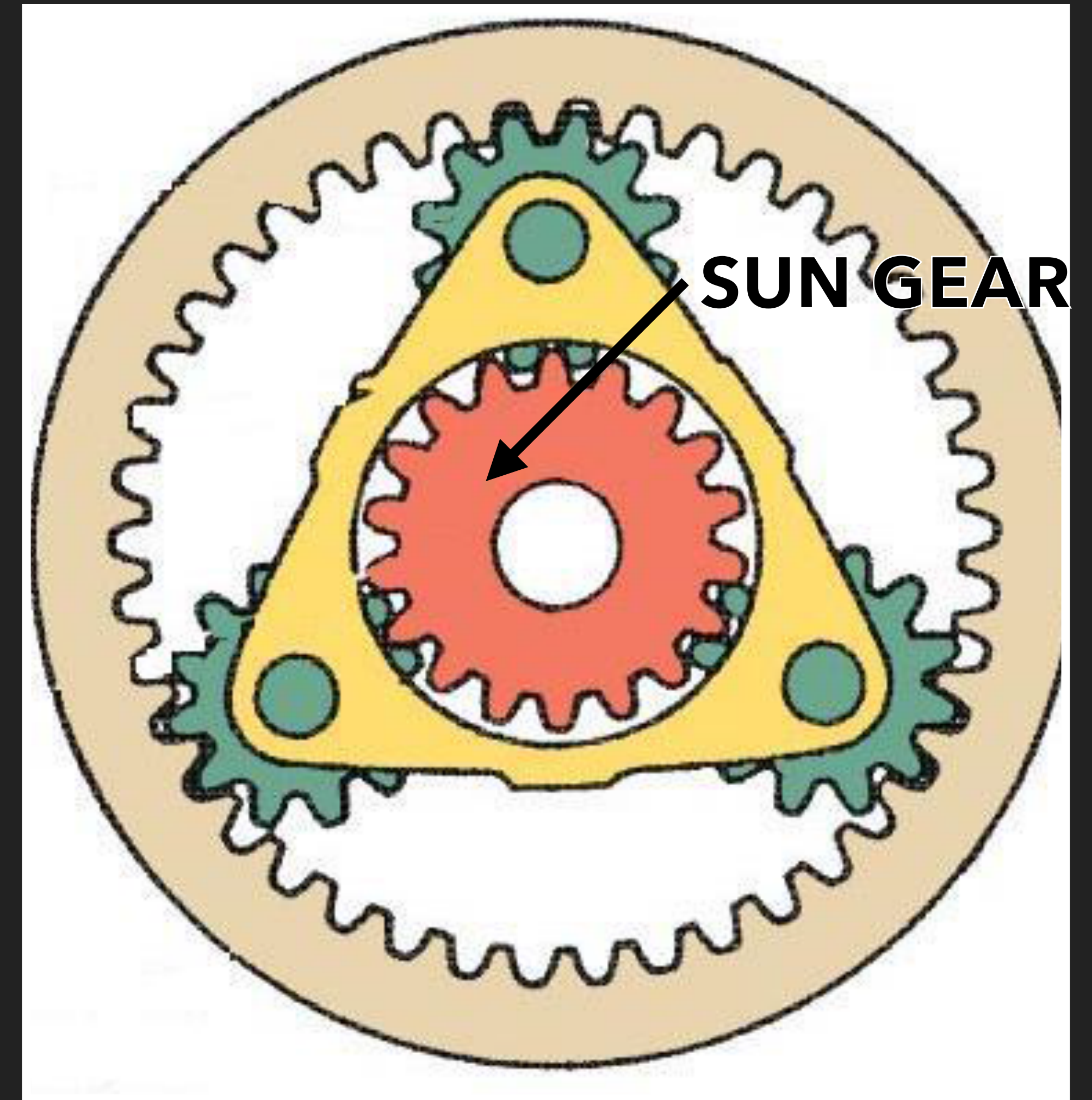
DRIVETRAINS LEVEL 2

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# PLANETARY GEAR SET BASICS

## THE SUN GEAR

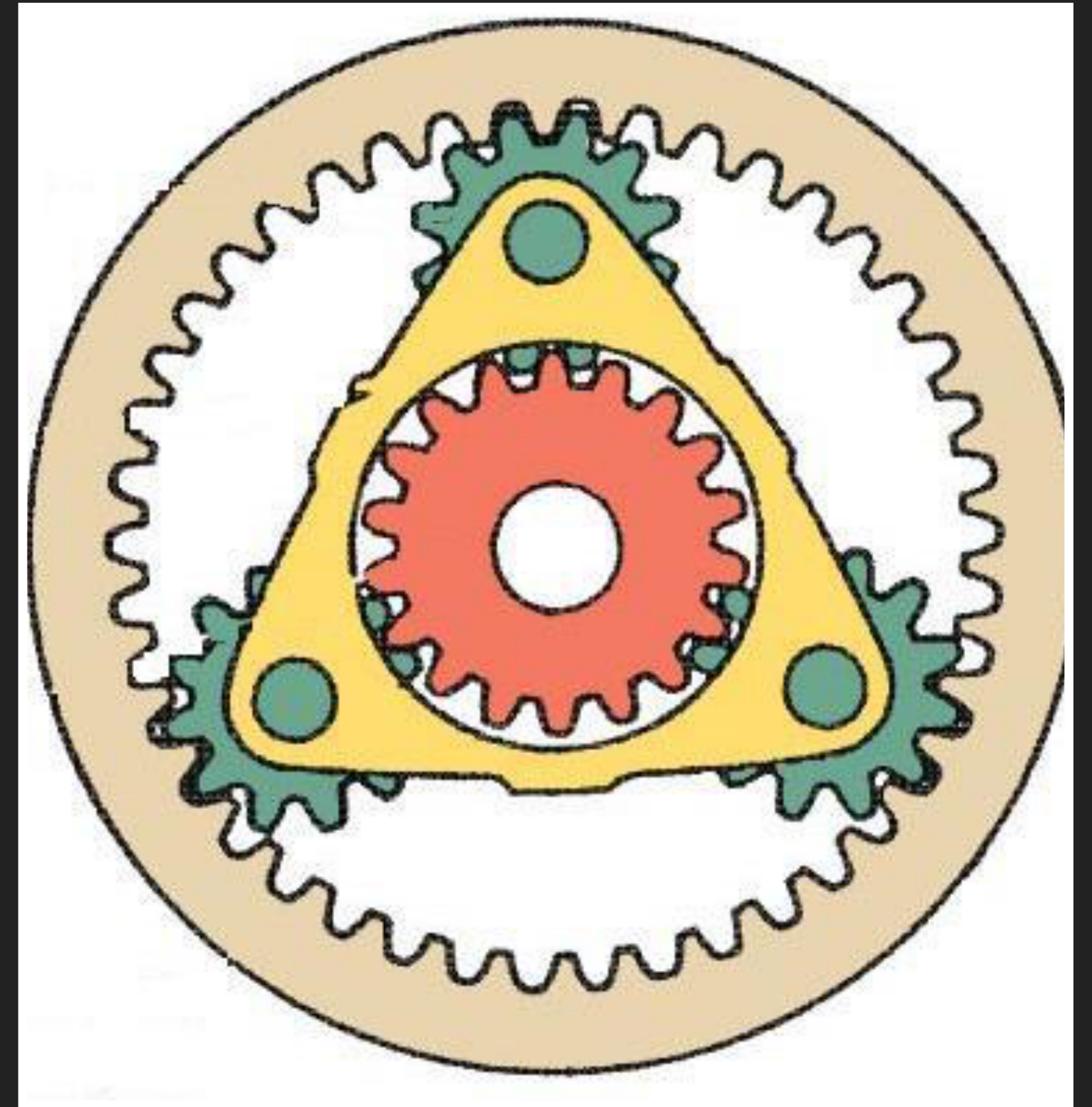
- ▶ THE **SUN** GEAR IS LOCATED IN THE CENTRE OF THE SIMPLE PLANETARY GEAR SET AND IS THE **SMALLEST** OF THE 3 GEARS





## THE PLANETARY CARRIER

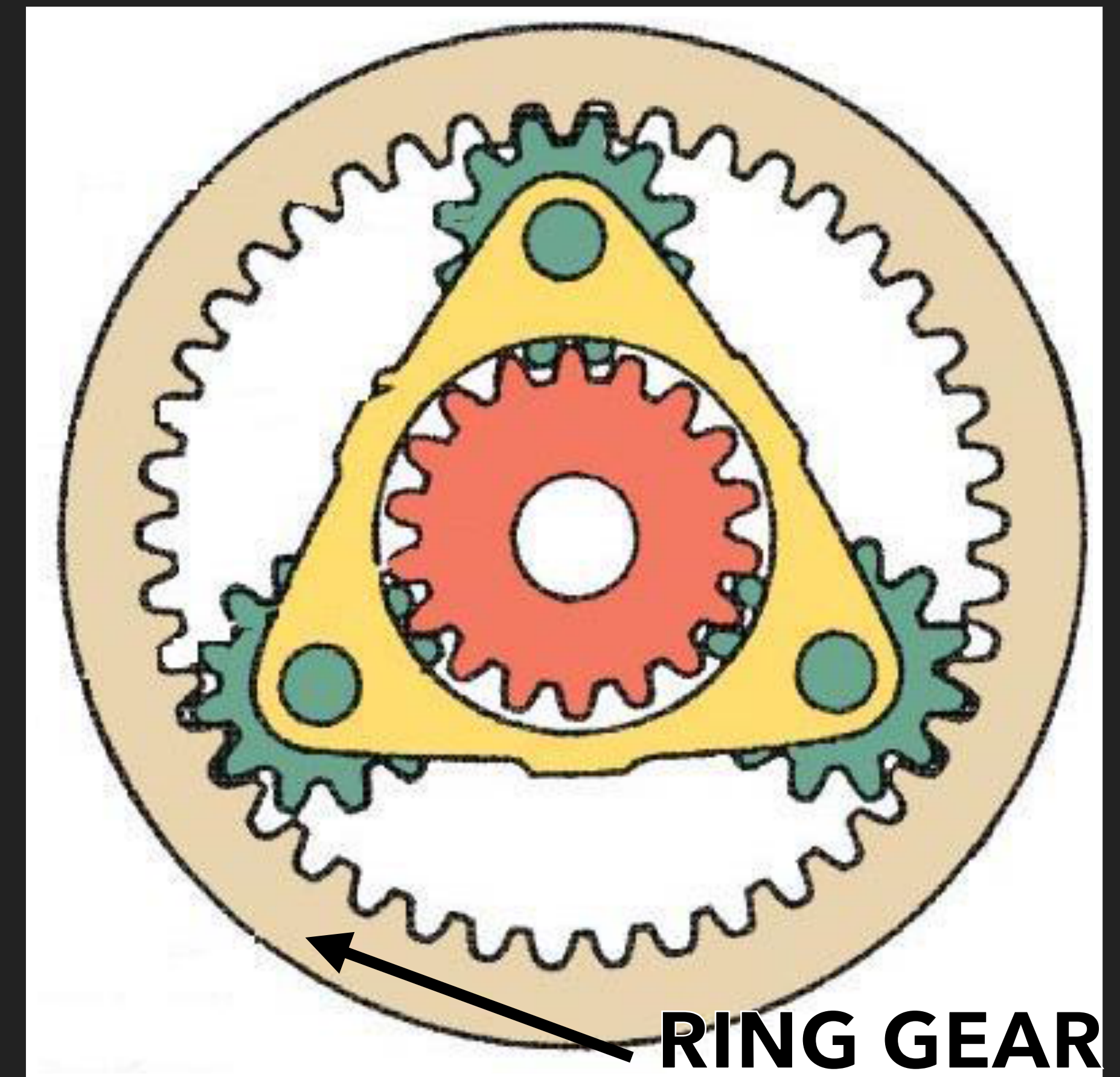
- ▶ GEAR INCLUDES 3 OR MORE PLANET PINION GEARS THAT CAN ROTATE IN THE CARRIER.
- ▶ IT IS ALSO THE **CARRIER GEAR** ACTION THAT DETERMINES THE PRIMARY DRIVING CONDITION OR RESULT OVERDRIVE, REVERSE OR UNDERDRIVE.
- ▶ CONSIDERED THE "**LARGEST**" OF THE 3 GEARS





## THE RING GEAR

- ▶ THE **R I N G** GEAR SURROUNDS THE GEAR SET AND IS IN MESH WITH THE PLANETARY CARRIER PINION GEARS.
- ▶ THE RING GEAR IS ALSO CALLED THE ANNULUS GEAR.
- ▶ THE RING GEAR IS AN **INTERNALLY TOOTHED** GEAR.
- ▶ INTERNAL TOOTHED GEARS MESHED WITH AN EXTERNAL TOOTHED GEARS ROTATE IN THE SAME DIRECTION.



## SIMPLE PLANETARY GEAR SET

- ▶ TO TRANSFER TORQUE THROUGH A PLANETARY GEAR SET WE MUST USE ONE GEAR AS AN INPUT (DRIVING), HOLD ANOTHER GEAR, AND THE 3RD GEAR THEN BECOMES THE OUTPUT (DRIVEN).
- ▶ THE PRIMARY DRIVING CONDITION (RESULT) IS DETERMINED BY THE CARRIER.
- ▶ FIRST, ALWAYS ASK YOURSELF, WHAT IS THE CARRIER DOING?
- ▶ IT COULD BE THE INPUT (DRIVING), IT COULD BE HELD, OR IT COULD BE THE OUTPUT (DRIVEN).

## RULE # 1

### WHAT IS THE CARRIER DOING

- ▶ OVERDRIVE IF THE CARRIER IS THE INPUT
- ▶ REVERSE IF THE CARRIER IS HELD
- ▶ UNDER DRIVE IF THE CARRIER IS THE OUTPUT

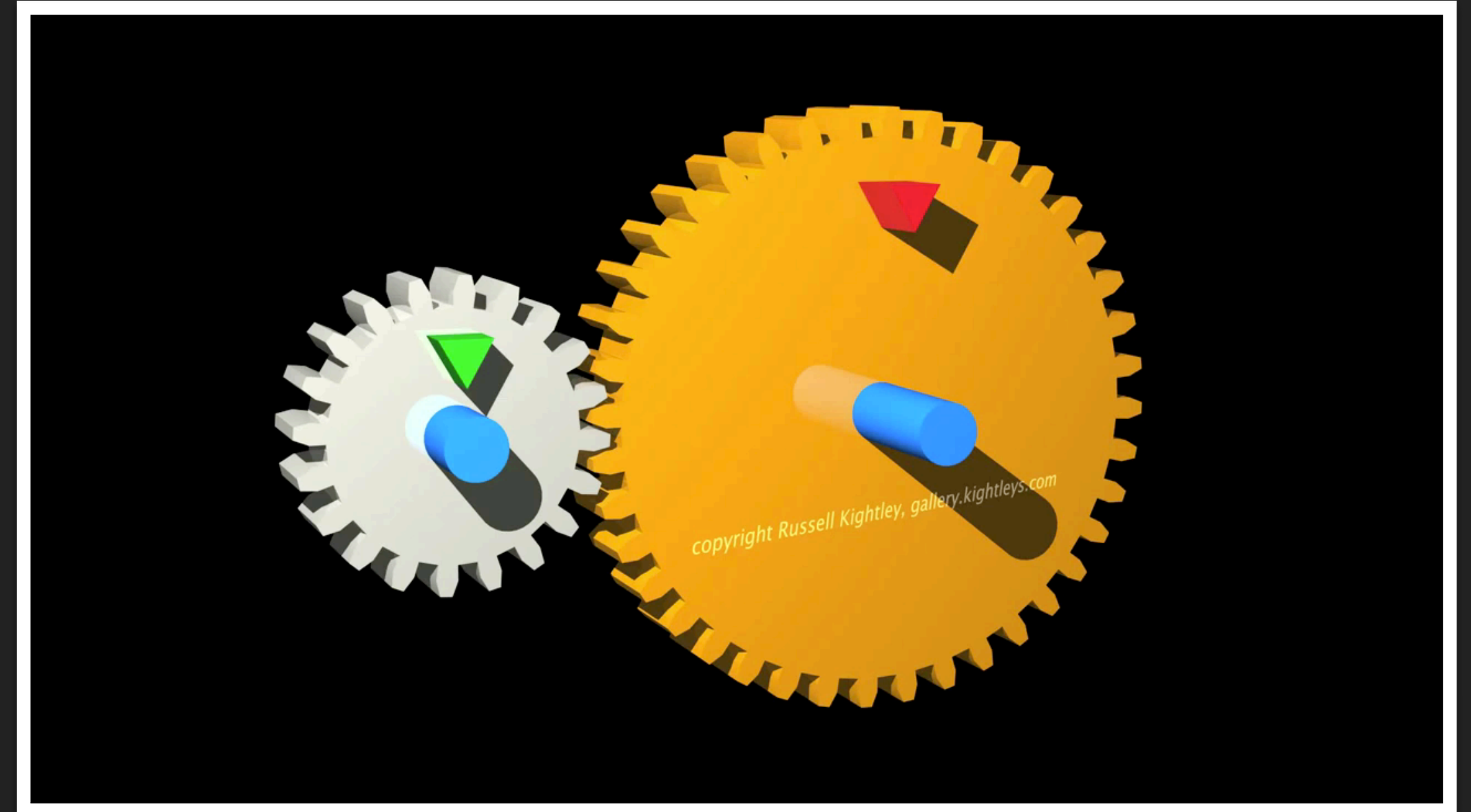


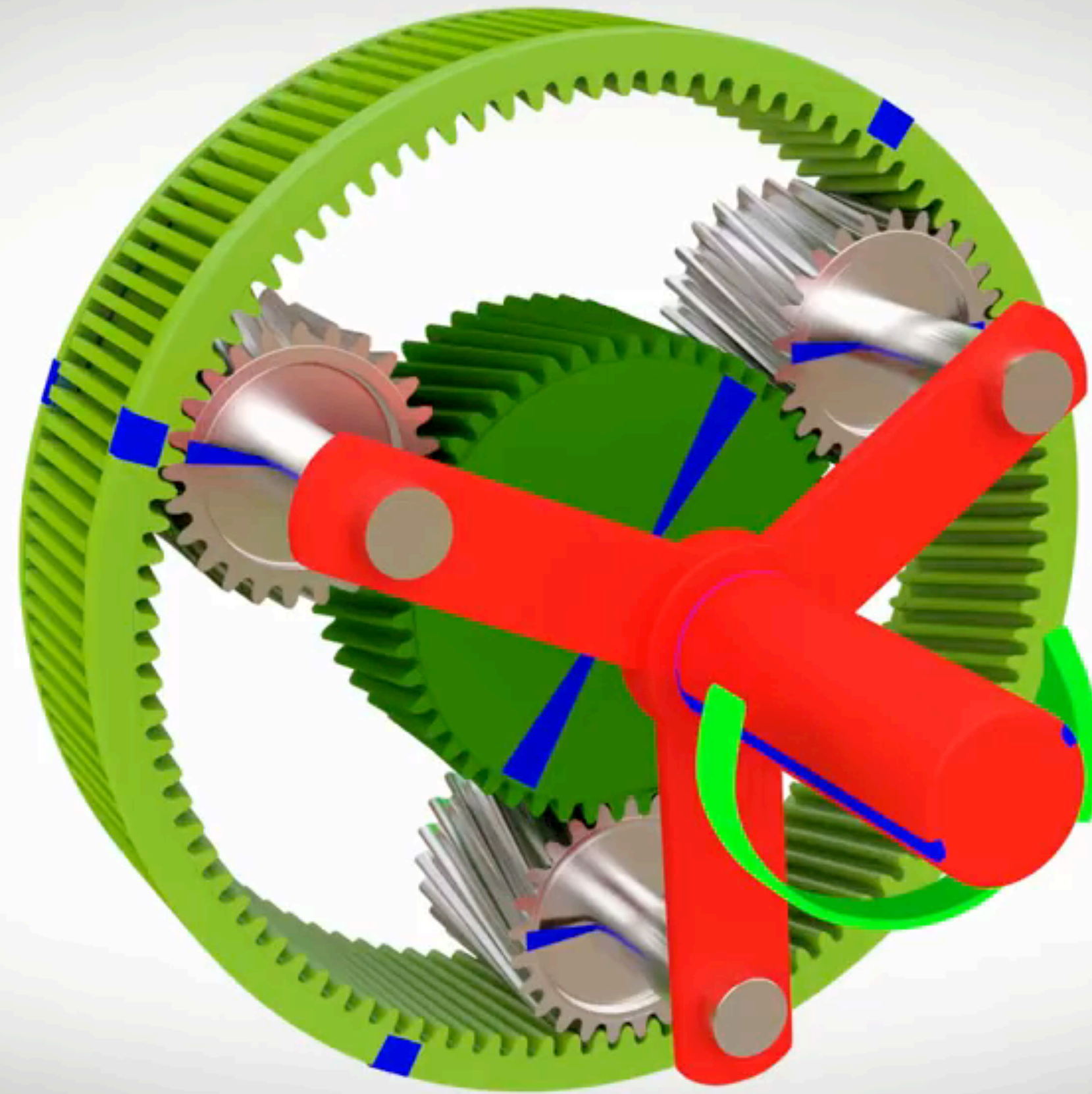


## RULE # 2

### BIG GEAR/SMALL GEAR THEORY

- ▶ A SMALL GEAR DRIVING A BIG GEAR RESULTS IN UNDERDRIVE
- ▶ A BIG GEAR DRIVING A SMALL GEAR RESULTS IN AN OVERDRIVE

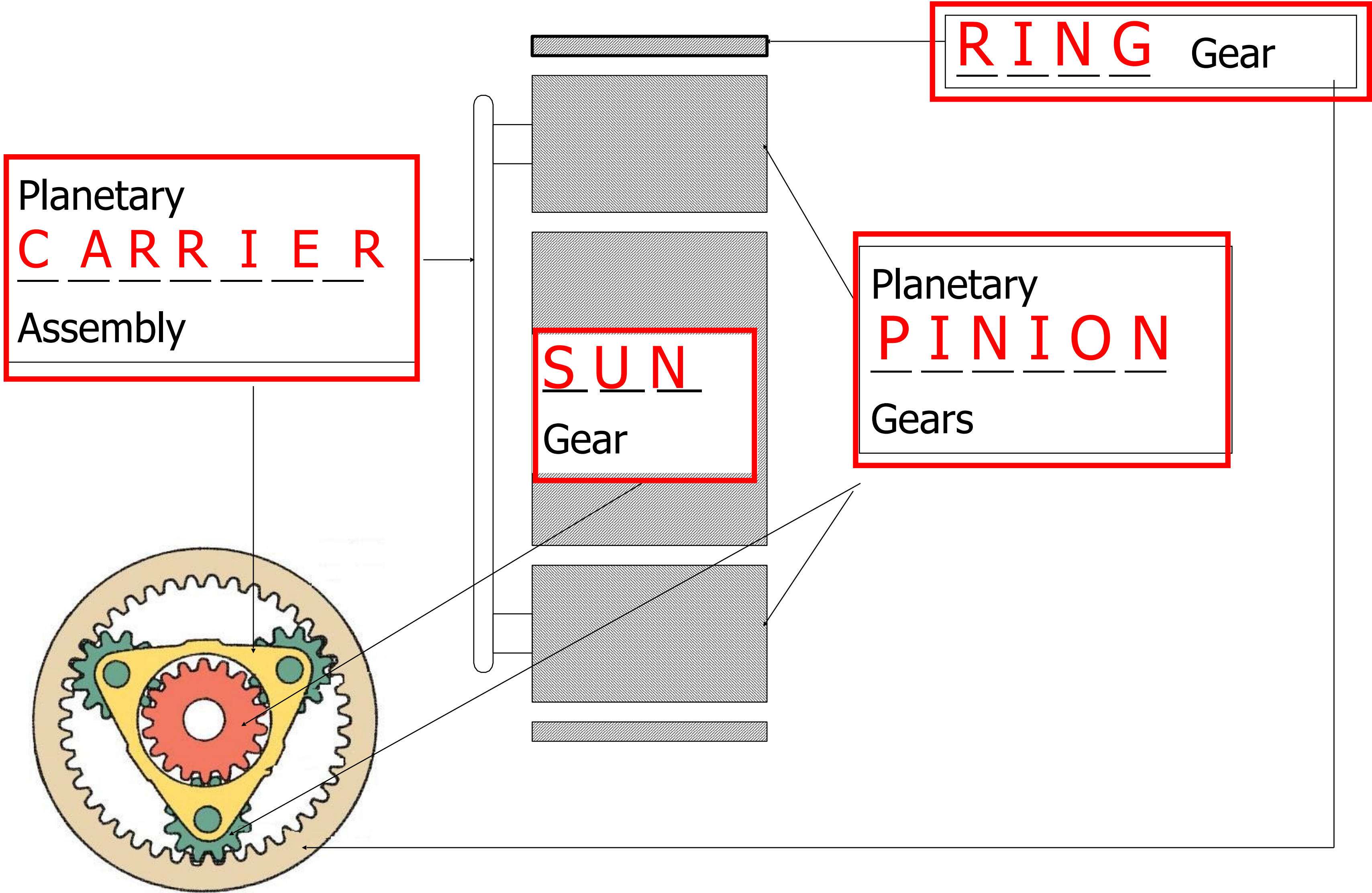




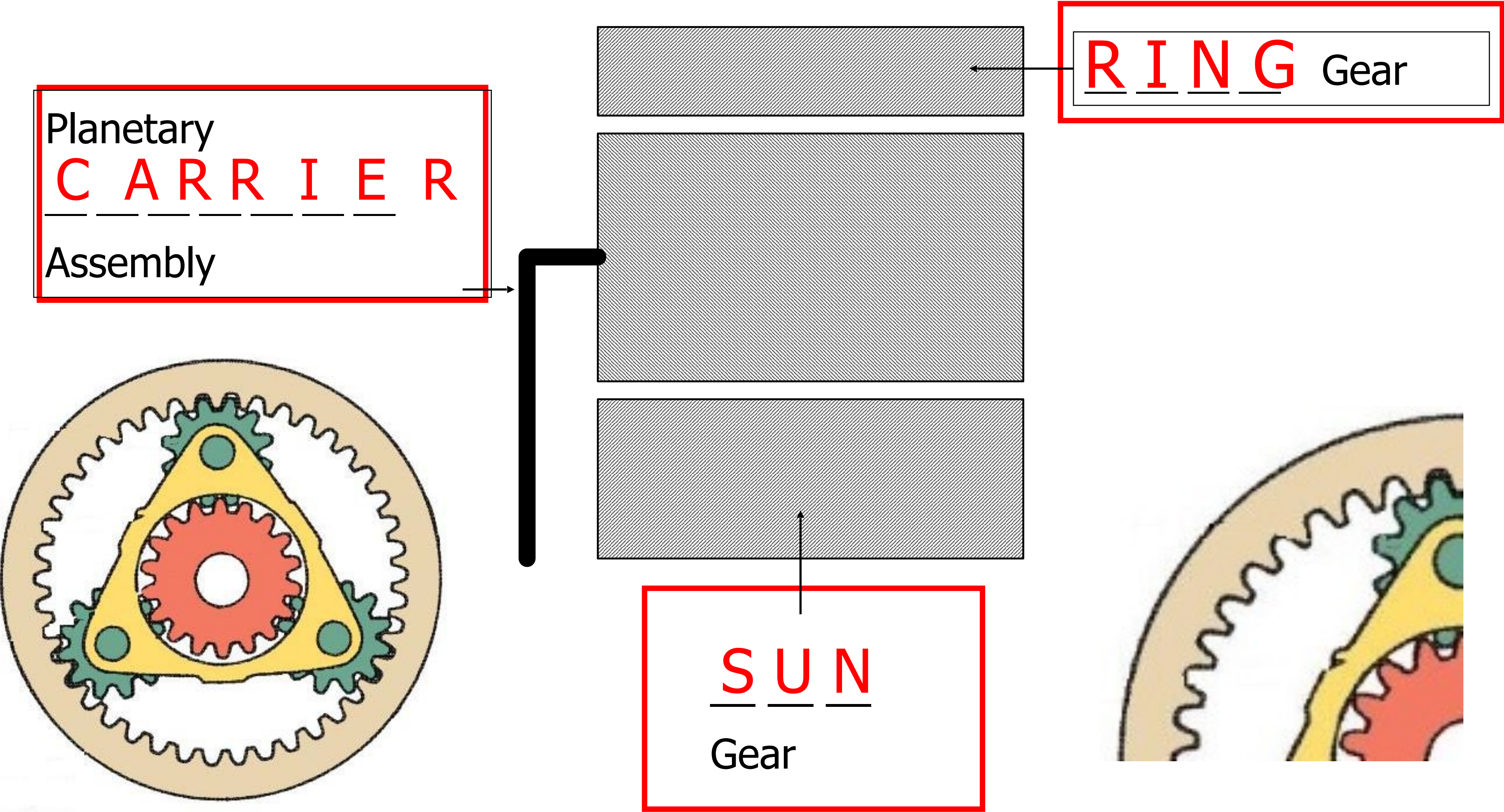
You **Tube** /LearnEngineering



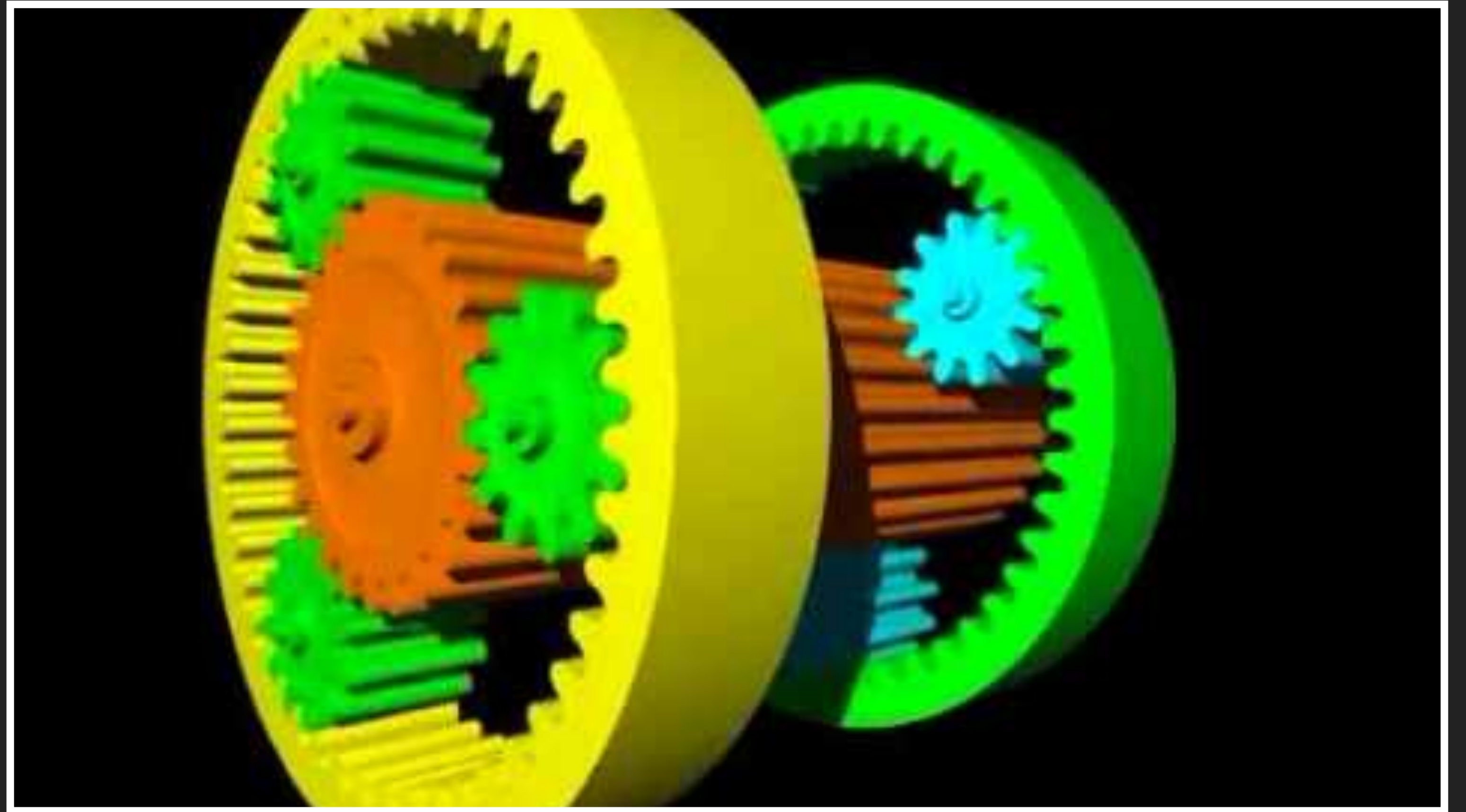
# SCHEMATIC VIEW OF A SIMPLE PLANETARY GEAR SET



# SCHEMATIC VIEW OF A SIMPLE PLANETARY GEAR SET





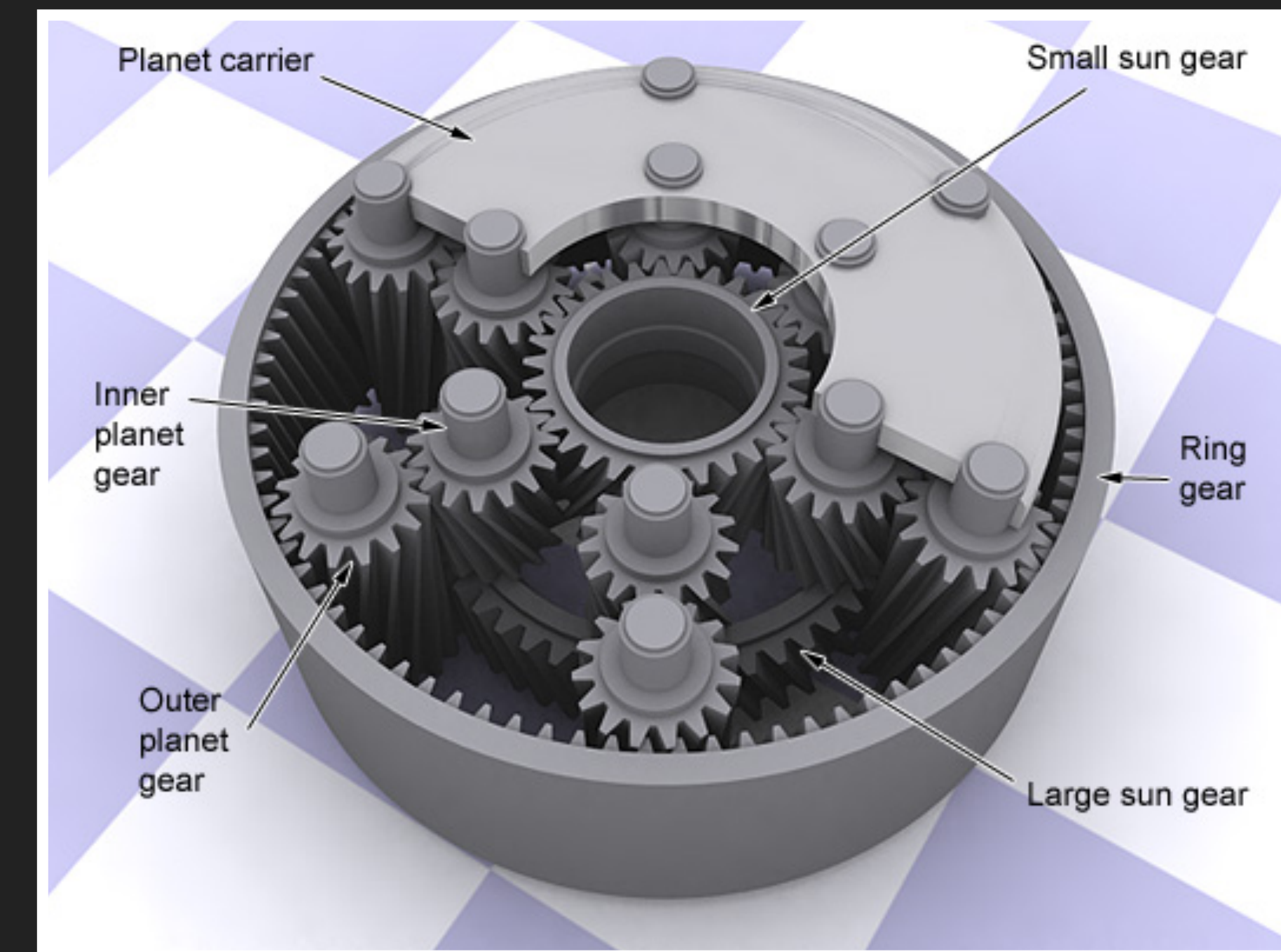


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# COMPOUND PLANETARY GEARSETS

## COMPOUND PLANETARY GEAR SET

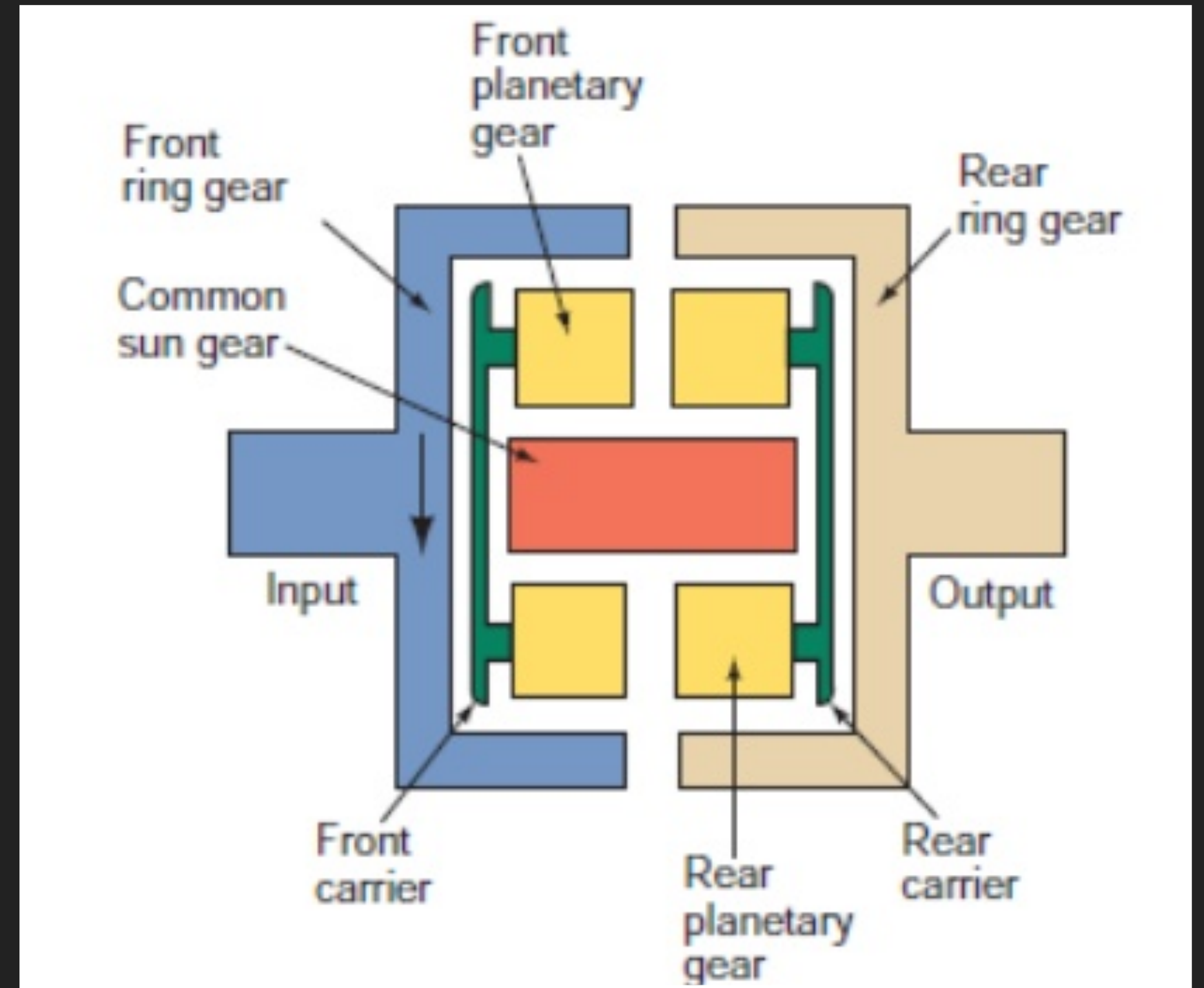
- ▶ CONFIGURATION THAT CONTAINS MORE THAN JUST THREE BASIC MEMBERS.
- ▶ ONE OR MORE SIMPLE GEAR SETS WITH ONE OR MORE "COMMON GEAR"
- ▶ CAPABLE OF PROVIDING VARIOUS COMBINATIONS OF GEAR REDUCTION, DIRECT DRIVE, NEUTRAL, REVERSE, AND OVERDRIVE





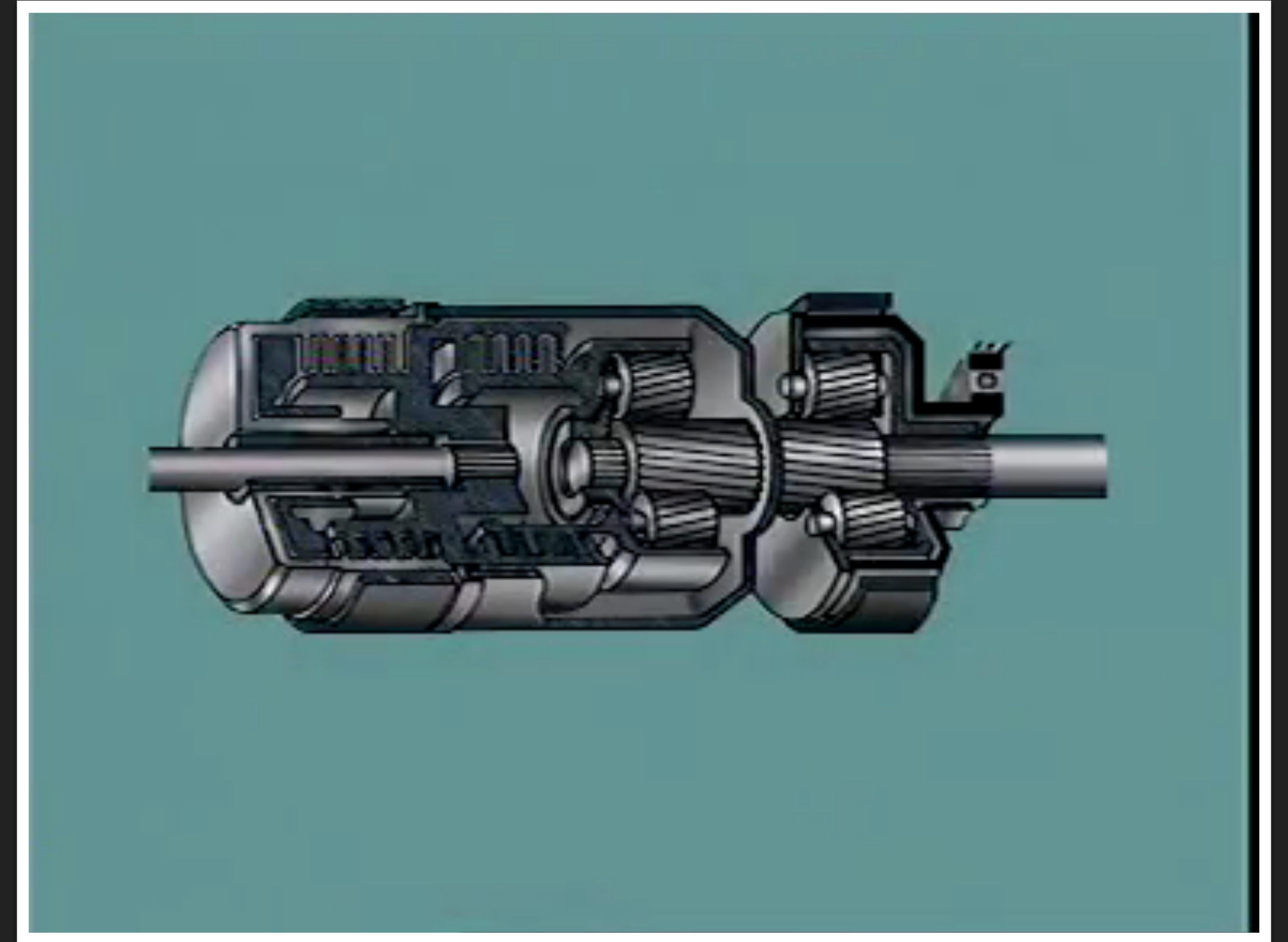
## SIMPSON GEAR SET

- ▶ MOST POPULAR COMPOUND DESIGNS
- ▶ CONSISTS OF TWO SIMPLE PLANETARY GEAR SETS THAT SHARE A COMMON SUN.



## SIMPSON GEAR SET

- ▶ THIS COMBINATION OF GEARS IS CAPABLE PROVIDING 3 FORWARD GEARS, AS WELL AS NEUTRAL AND REVERSE.
- ▶ MAIN DIFFERENCE IS THE NUMBER OF GEAR RATIOS AVAILABLE BY USING MORE THAN ONE GEAR SET.



<https://www.youtube.com/watch?v=wY3YcmIDutQ>



# SCHEMATIC VIEW OF A SIMPSON PLANETARY GEAR SET

1 F R O N T / F O R W A R D

Ring Gear

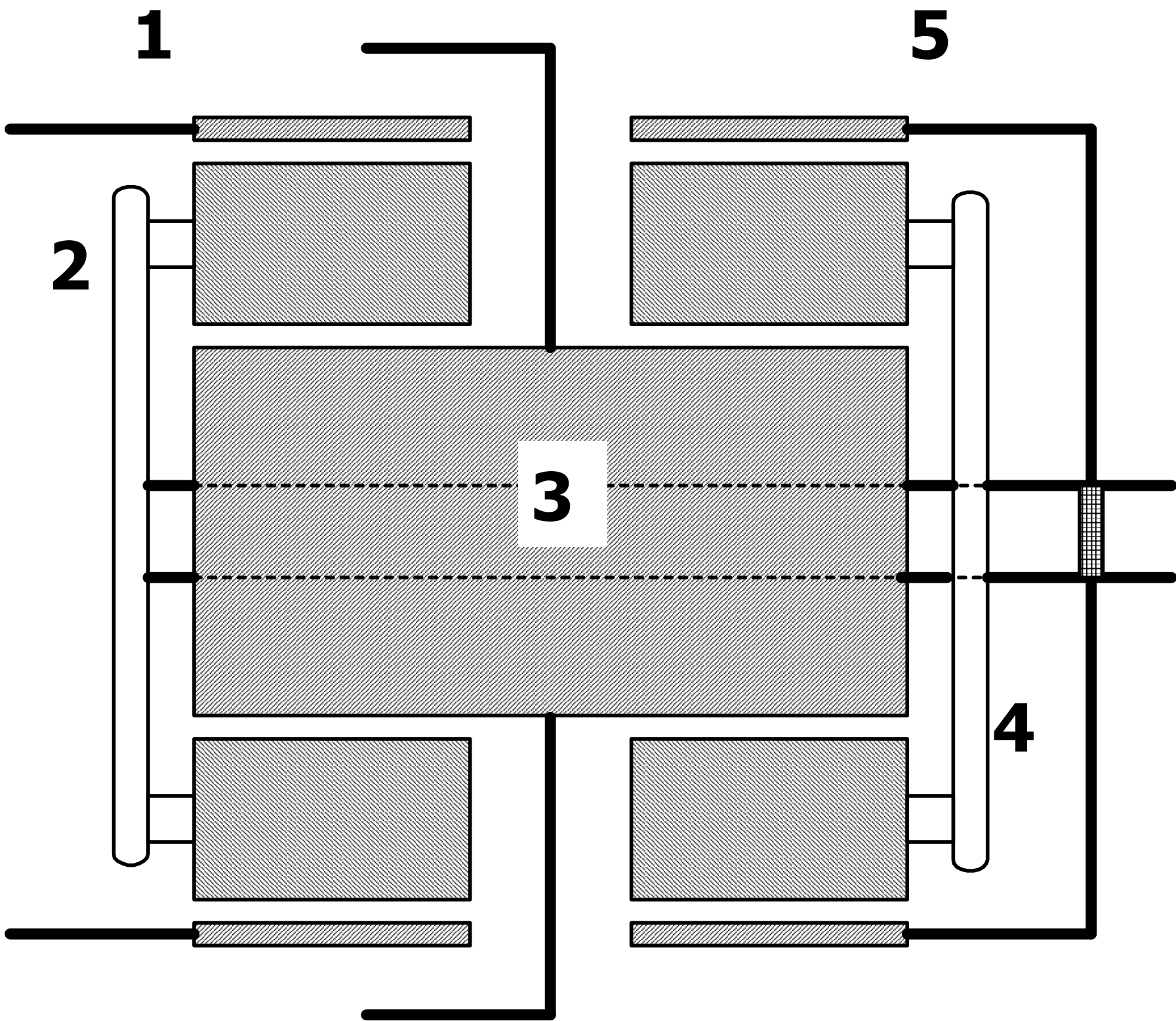
2 Front P L A N E T A R Y

Carrier

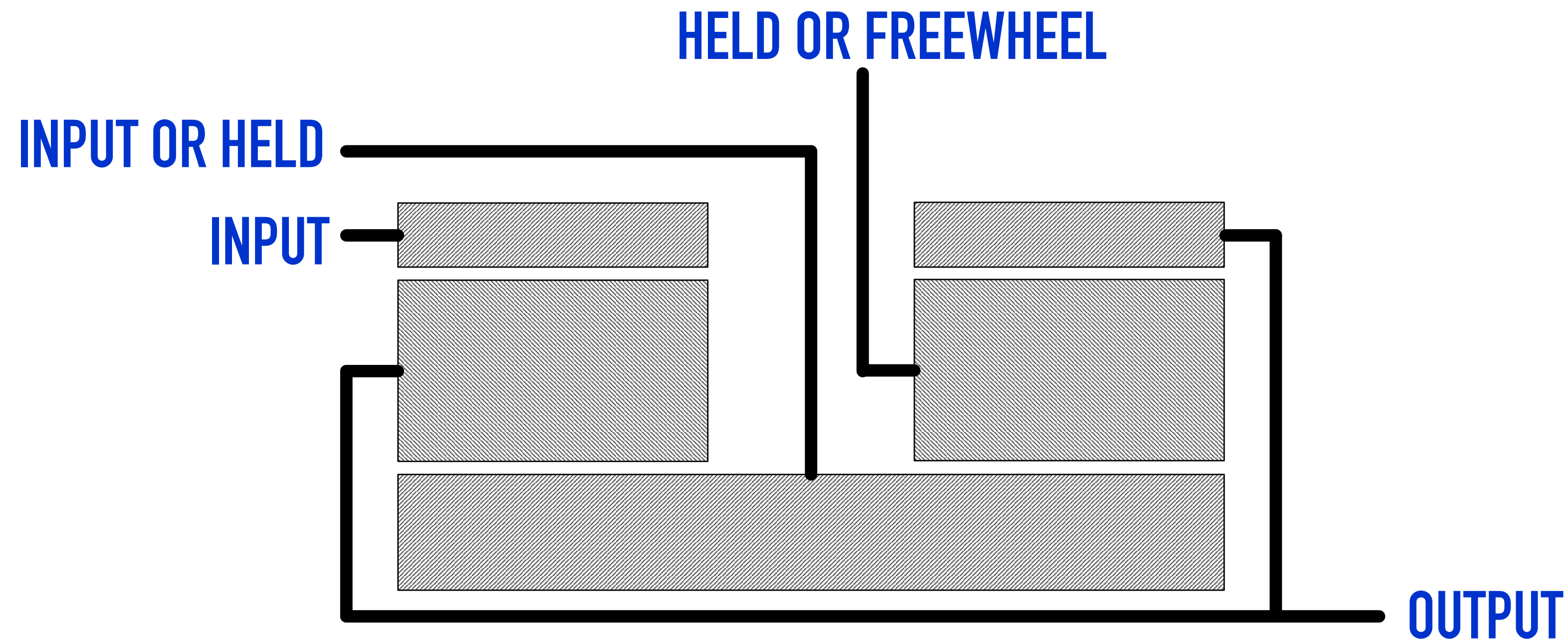
3 C O M M O N Sun Gear

4 R E A R Planetary Carrier

5 Low / Reverse Rear R I N G Gear



# SCHEMATIC VIEW OF A SIMPSON PLANETARY GEAR SET



FRONT / FORWARD RING GEAR IS **DRIVEN**

**SUN** GEAR IS DRIVEN OR HELD

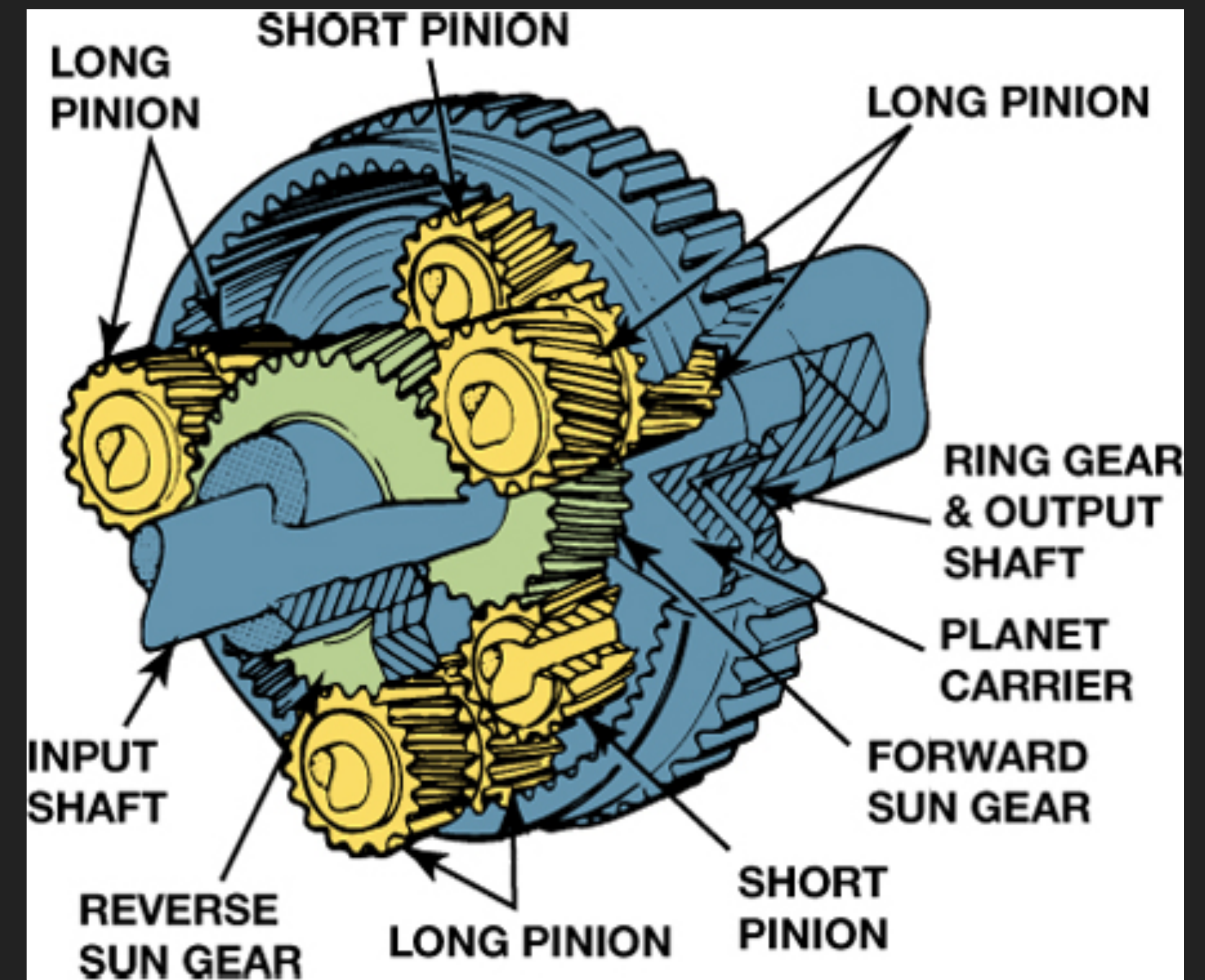
REAR CARRIER IS **HELD**

ALL **OUTPUT** IS THROUGH THE FRONT CARRIER OR REAR RING GEAR



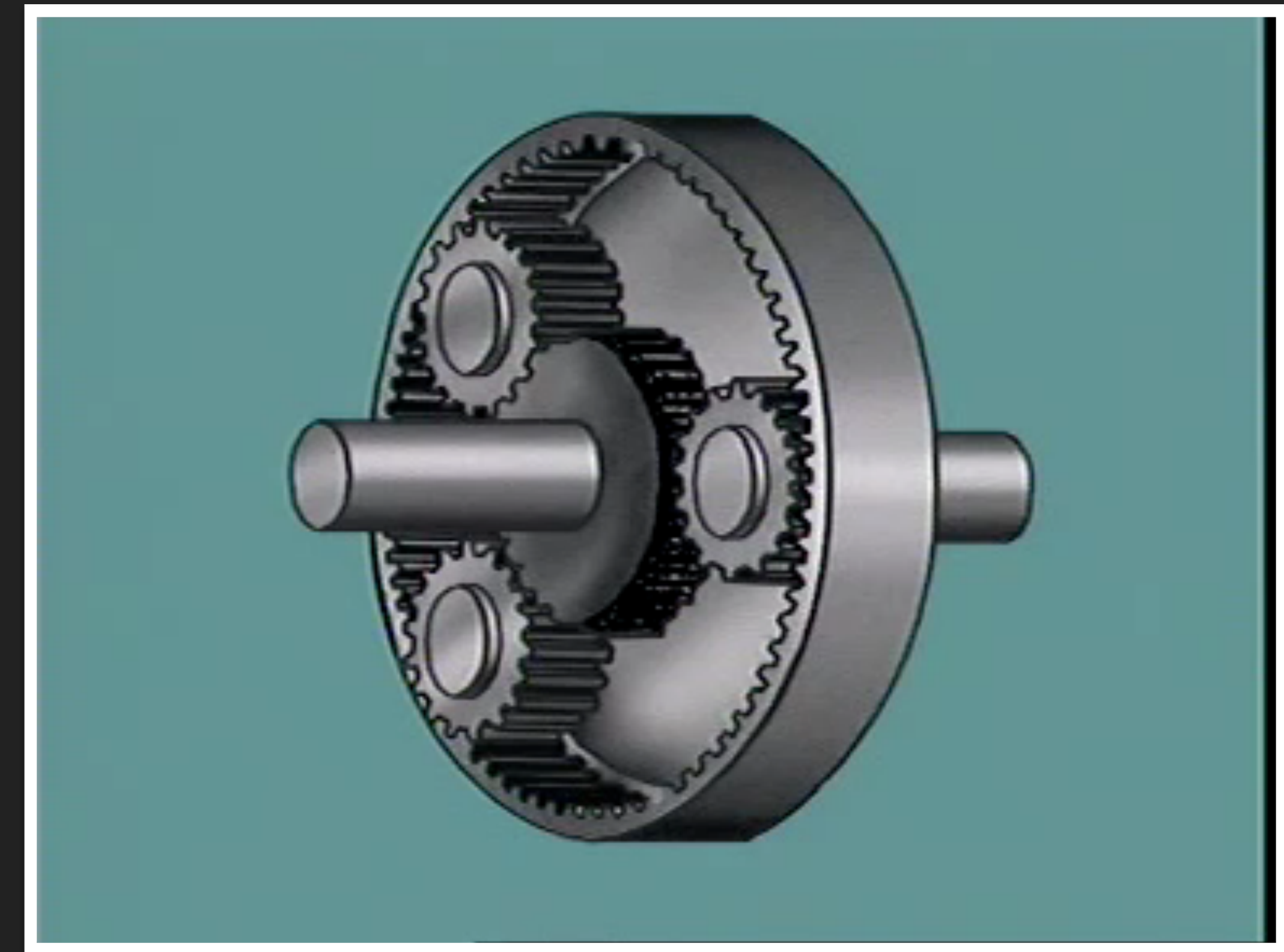
## RAVIGNEAUX GEAR SET

- ▶ ANOTHER POPULAR COMPOUND GEAR SET DESIGN
- ▶ CONTAINS TWO SUN GEARS, TWO PLANETARY PINION SETS (ONE LONGER THAN THE OTHER) SUPPORTED IN ONE CARRIER, AND A SINGLE RING GEAR



## RAVIGNEAUX GEAR SET

- ▶ THIS DESIGN PROVIDES 4 FORWARD GEARS (TWO IN REDUCTION, ONE IN DIRECT, AND ONE IN OVERDRIVE) AS WELL AS NEUTRAL AND REVERSE.
- ▶ BASIC PLANETARY GEAR SET OPERATION, CONSTRUCTION, AND CONTROL METHODS STILL APPLY.





FRONT VIEW OF A RAVIGNEAUX PLANETARY GEAR SET

- 1 

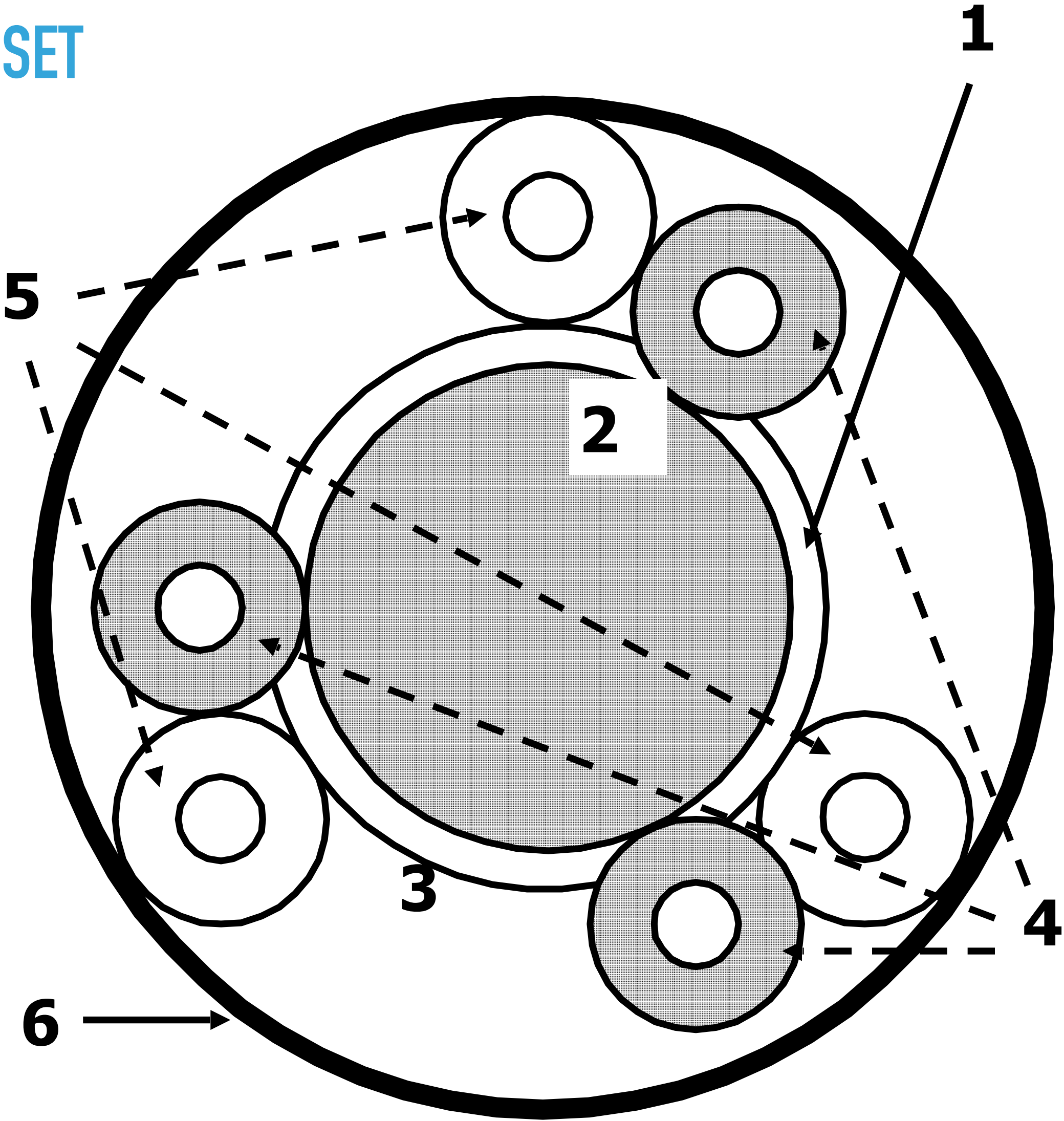
REVERSE

 Sun Gear (big)
- 2 Forward 

SUN

 Gear (small)
- 3 Common Planetary 

CARRIER
- 4 Short Planetary Pinions
- 5 Long Planetary Pinions
- 6 Ring Gear - Output



# **How a Ravigneaux Planetary Gear Set Works**

[www.green-translation-service.com](http://www.green-translation-service.com)

<https://youtu.be/7iTn8OWxVFU?si=0mZNHG99ZY3w3KER>