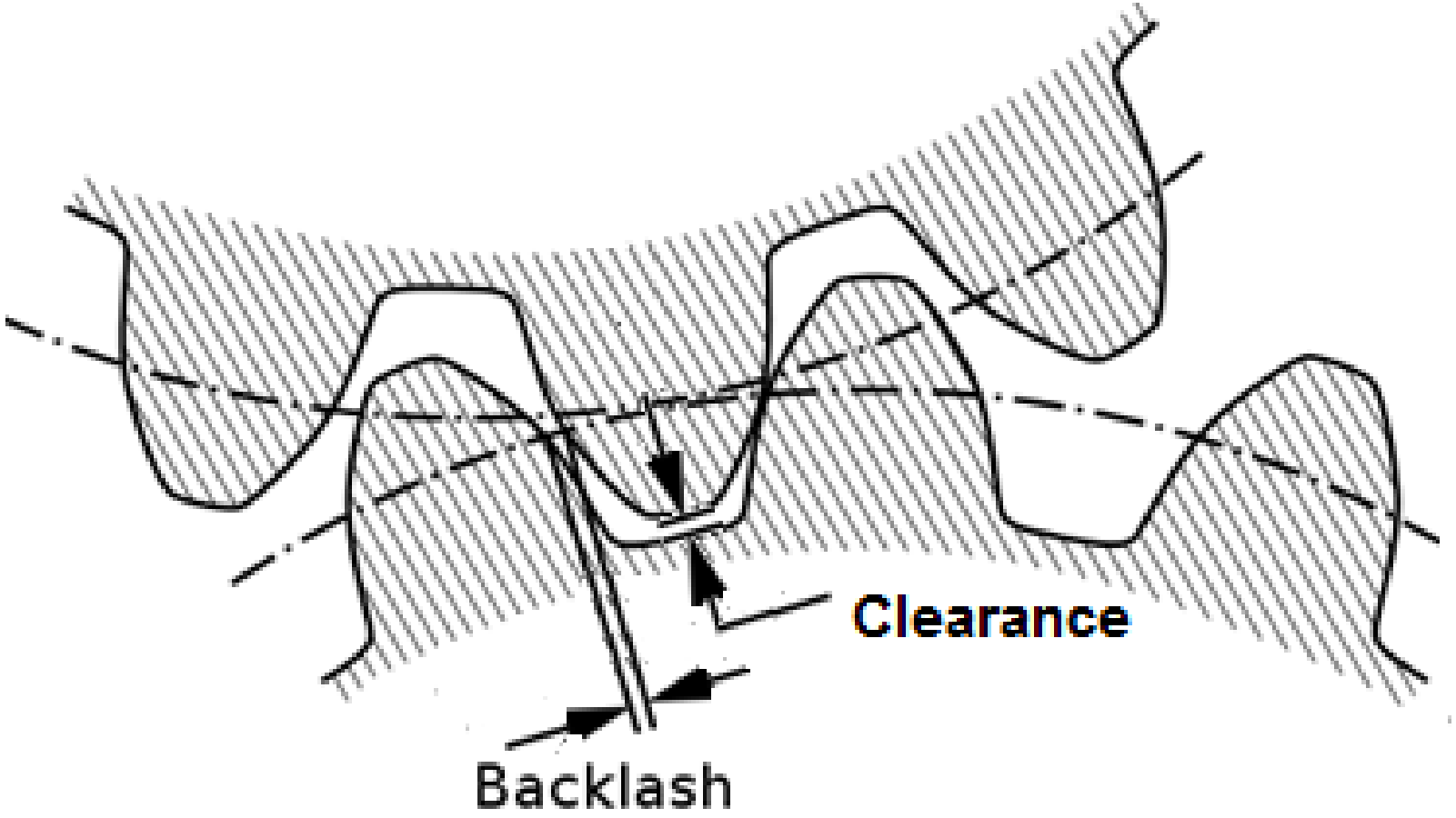
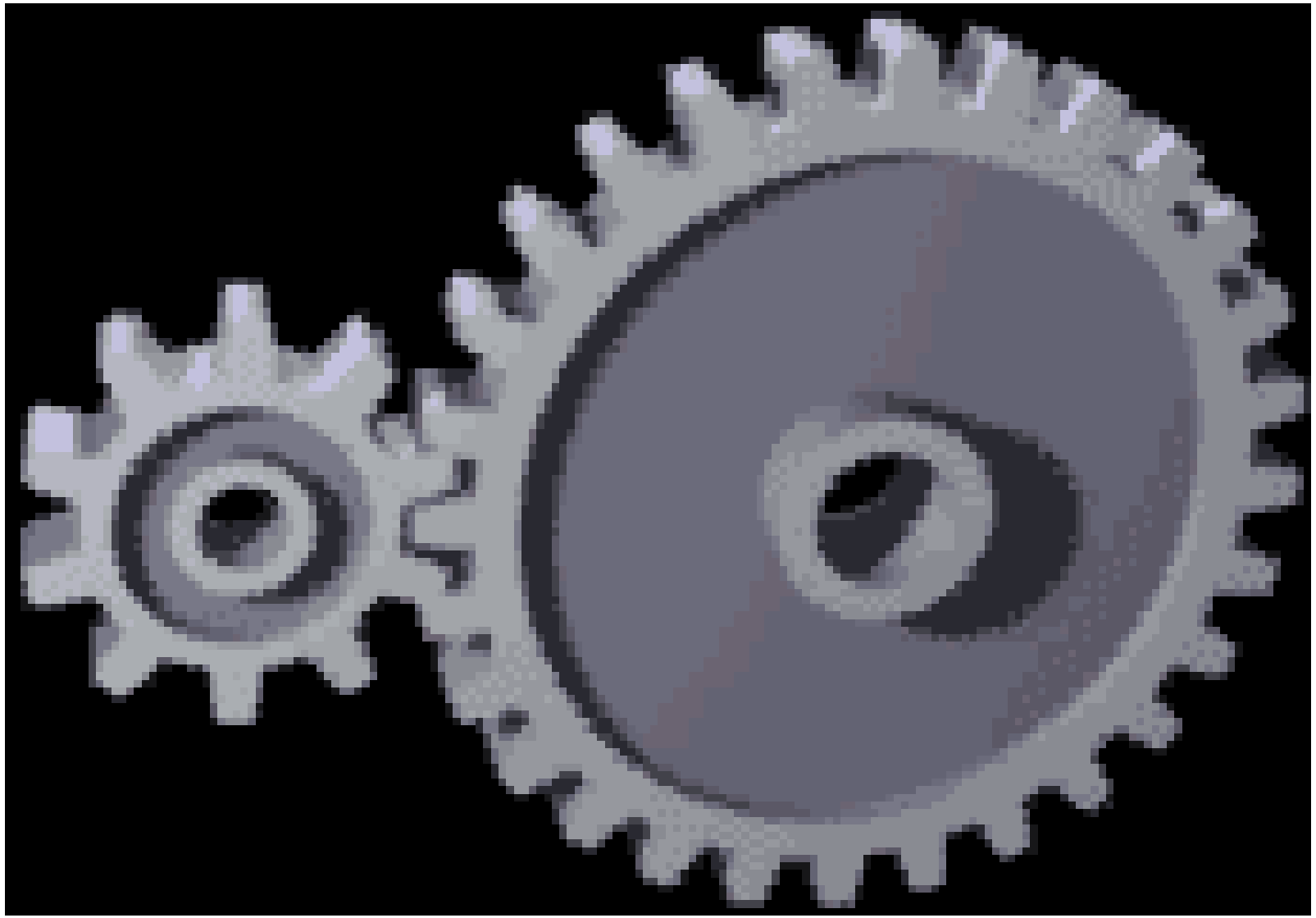
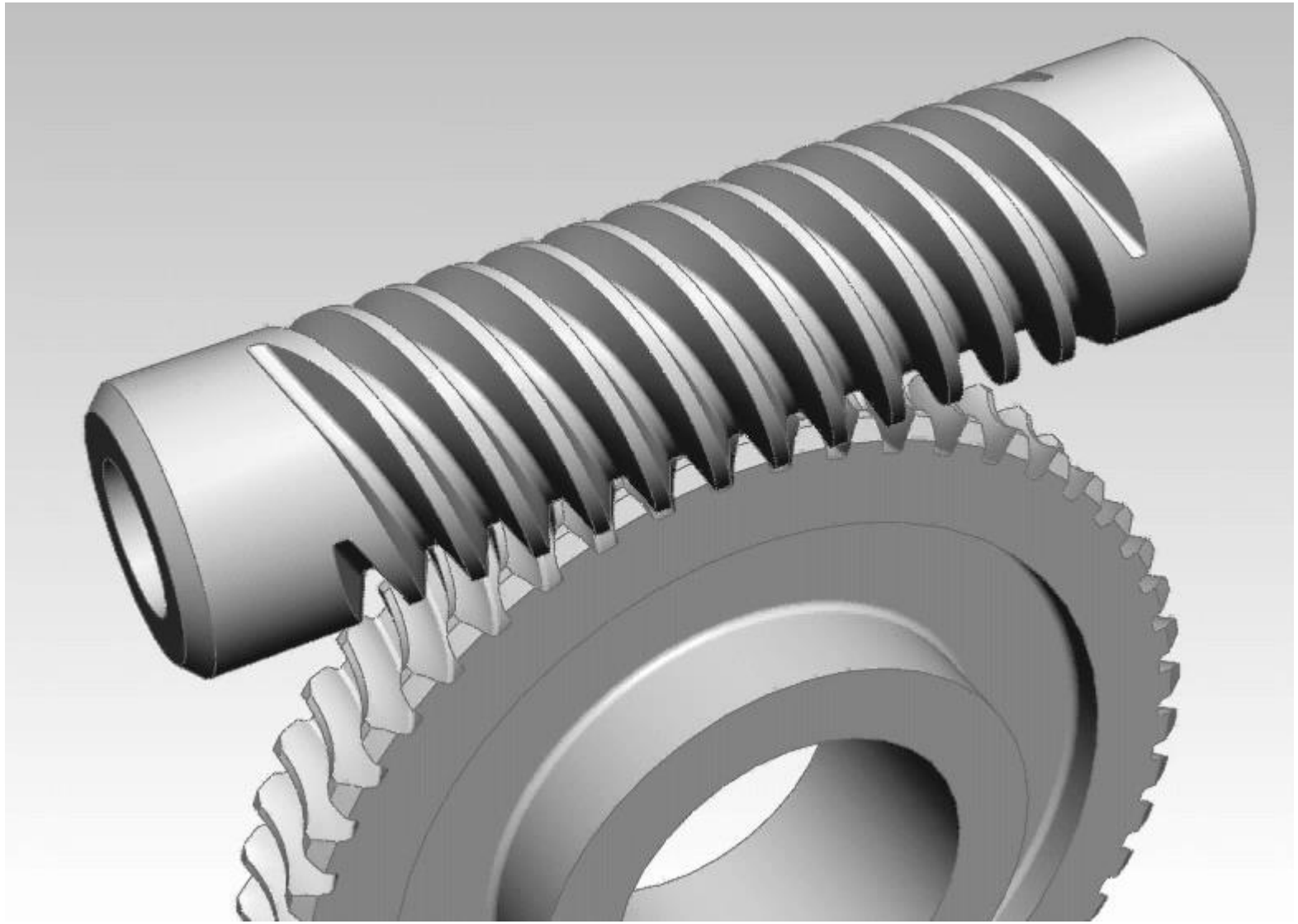
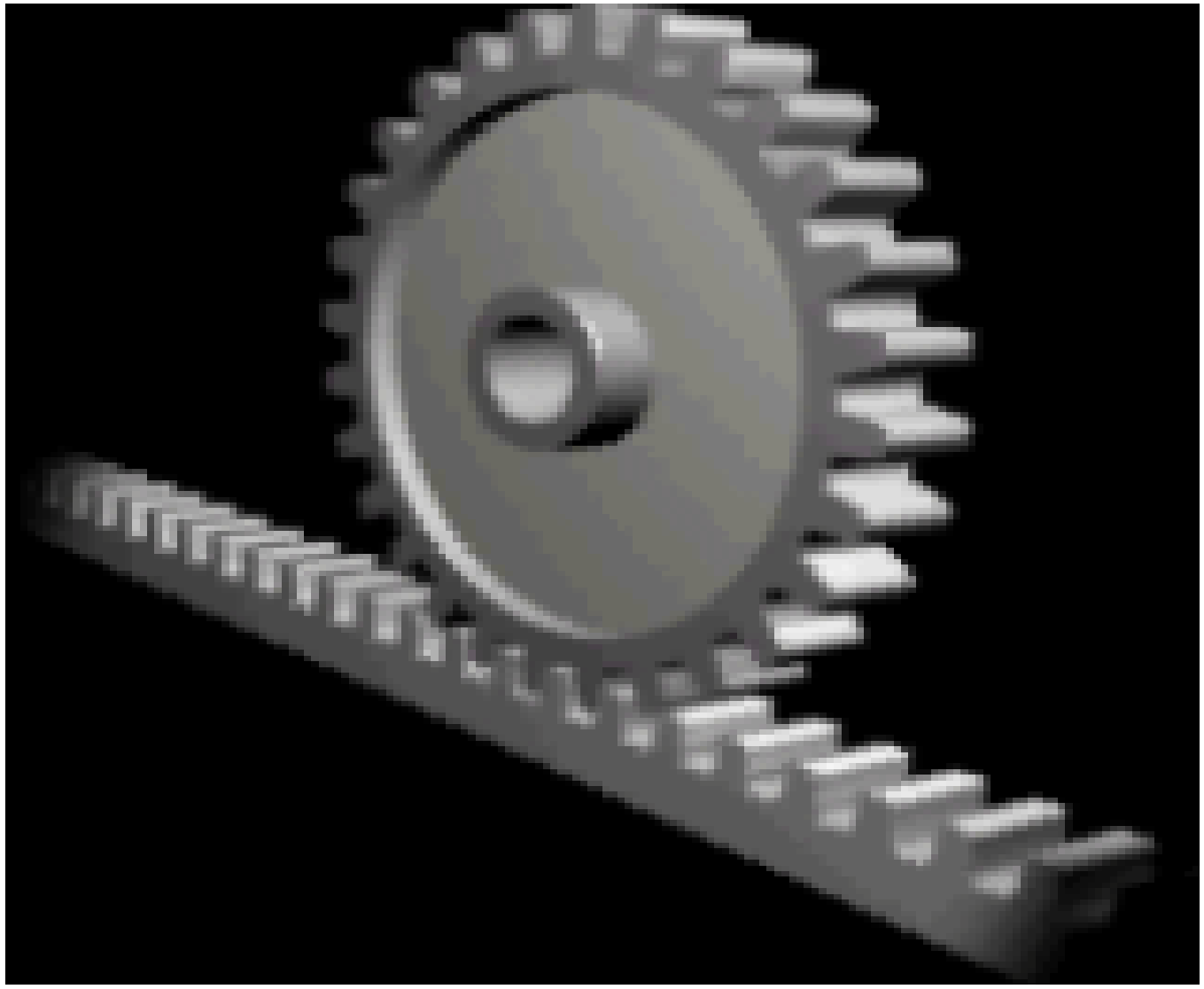
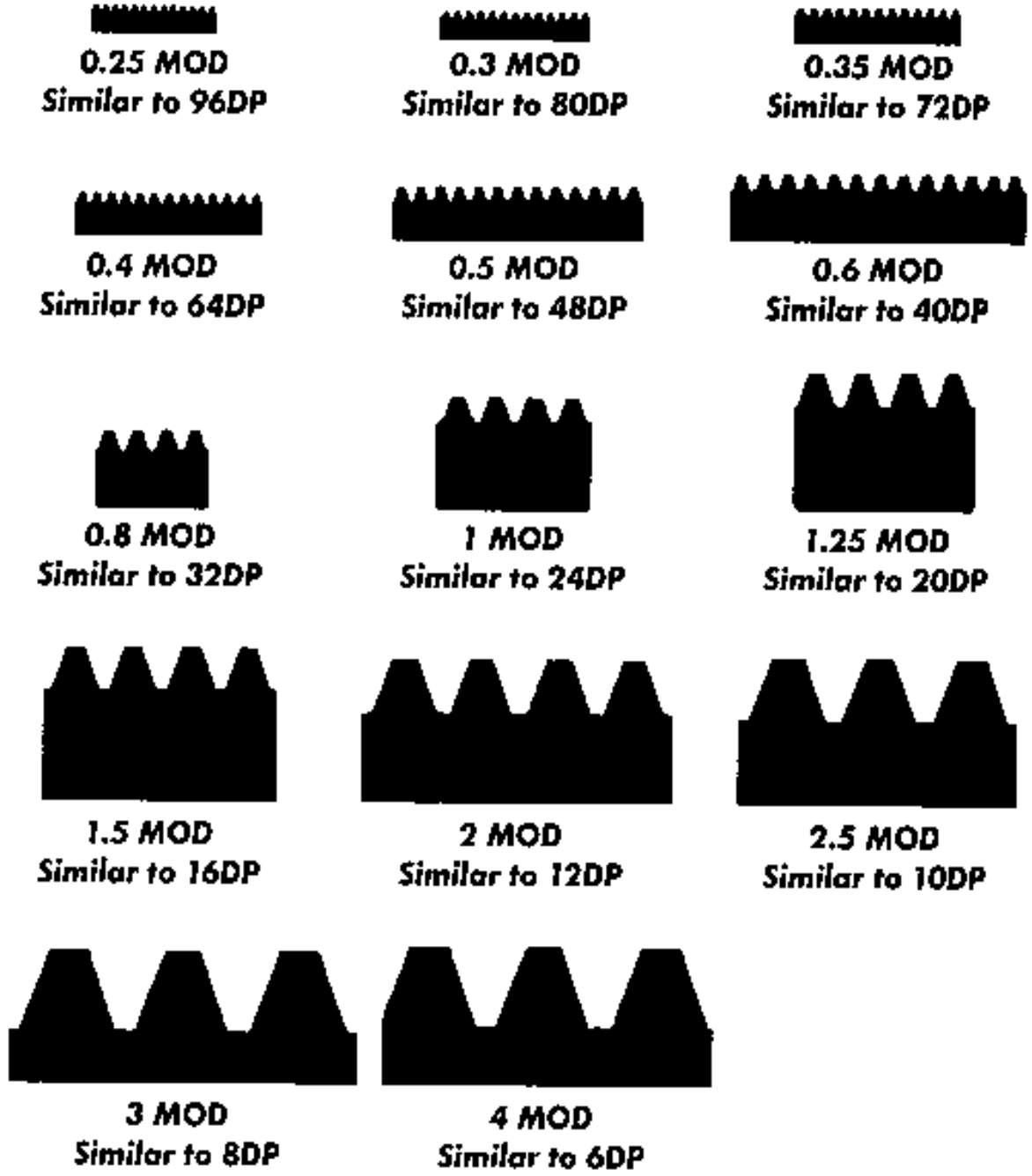
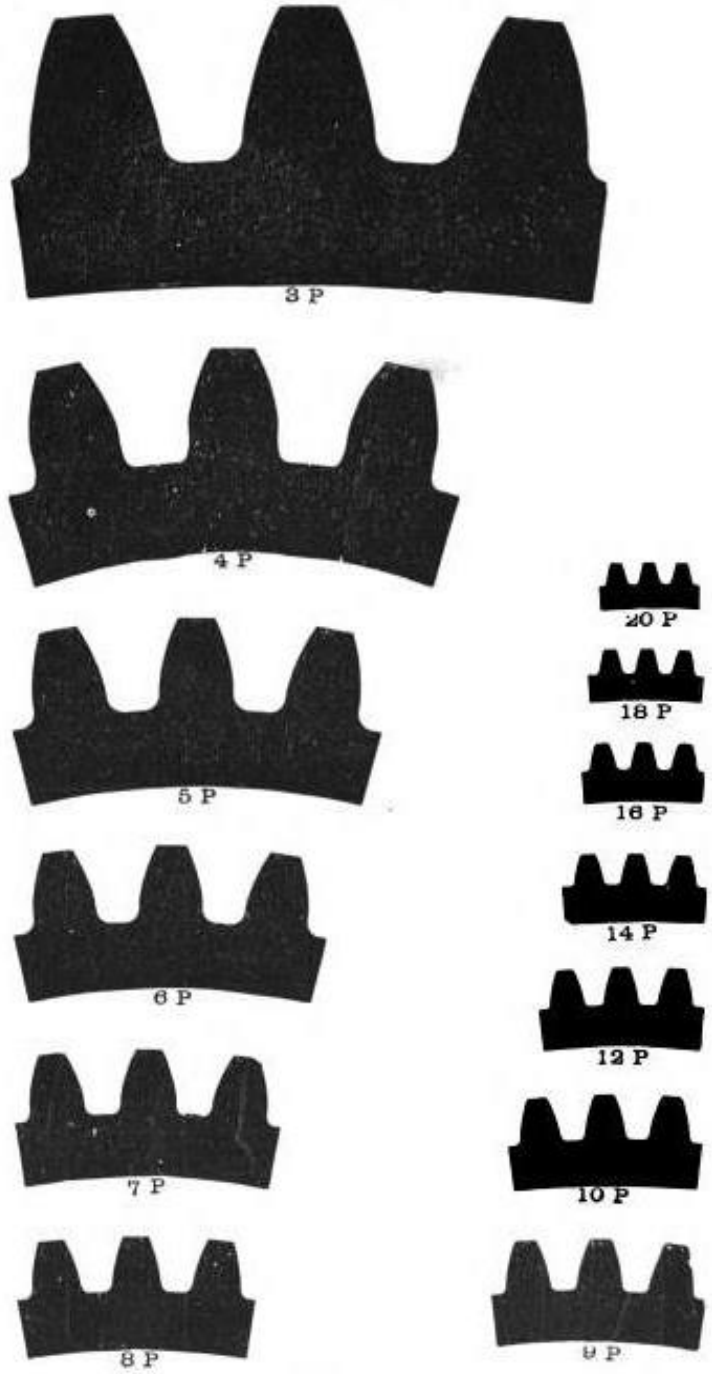

Clearance
Backlash



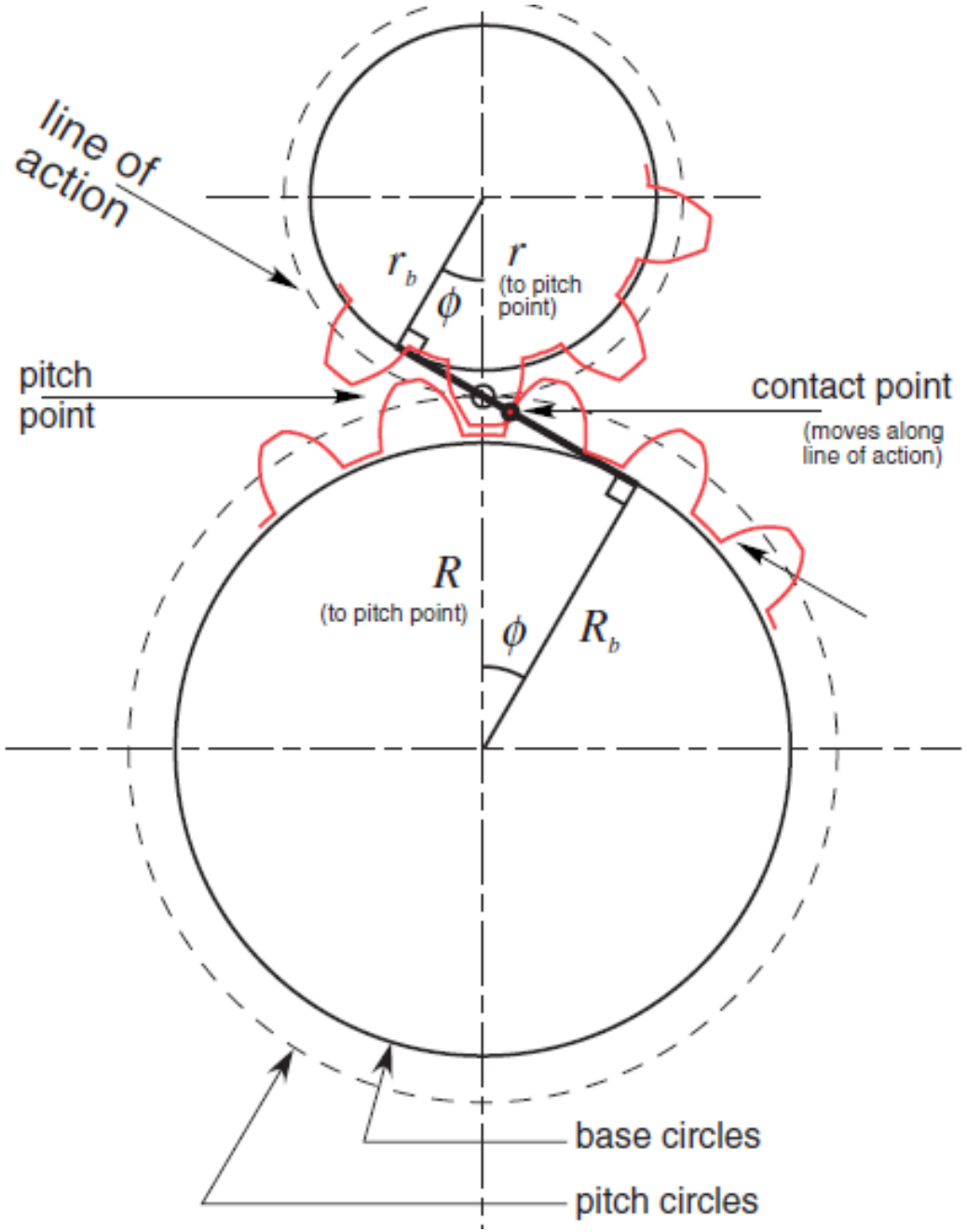


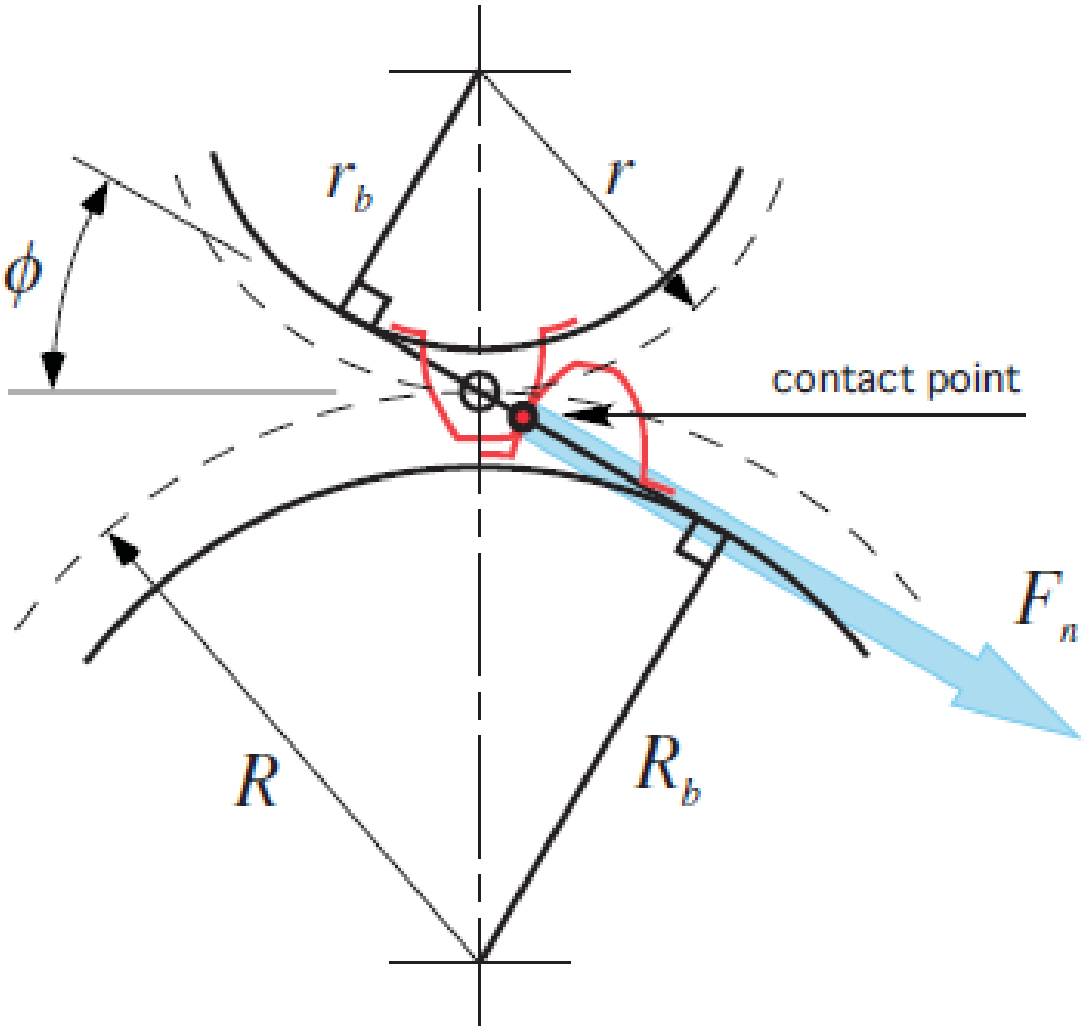


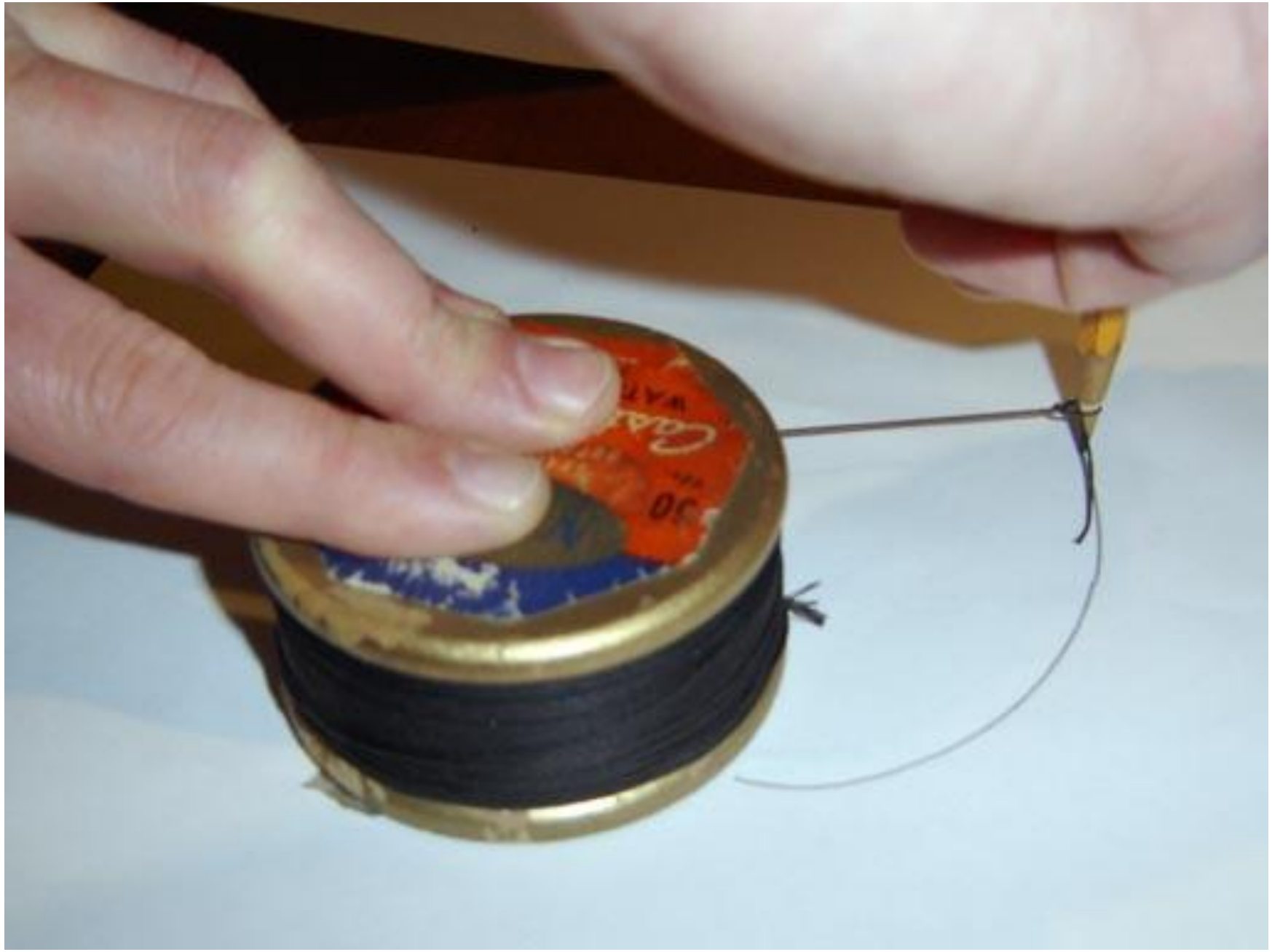

0.25 MOD
Similar to 96DP
0.3 MOD
Similar to 80DP
0.35 MOD
Similar to 72DP
0.4 MOD
Similar to 64DP
0.5 MOD
Similar to 48DP
0.6 MOD
Similar to 40DP
0.8 MOD
Similar to 32DP
1 MOD
Similar to 24DP
1.25 MOD
Similar to 20DP
1.5 MOD
Similar to 16DP
2 MOD
Similar to 12DP
2.5 MOD
Similar to 10DP
3 MOD
Similar to 8DP
4 MOD
Similar to 6DP

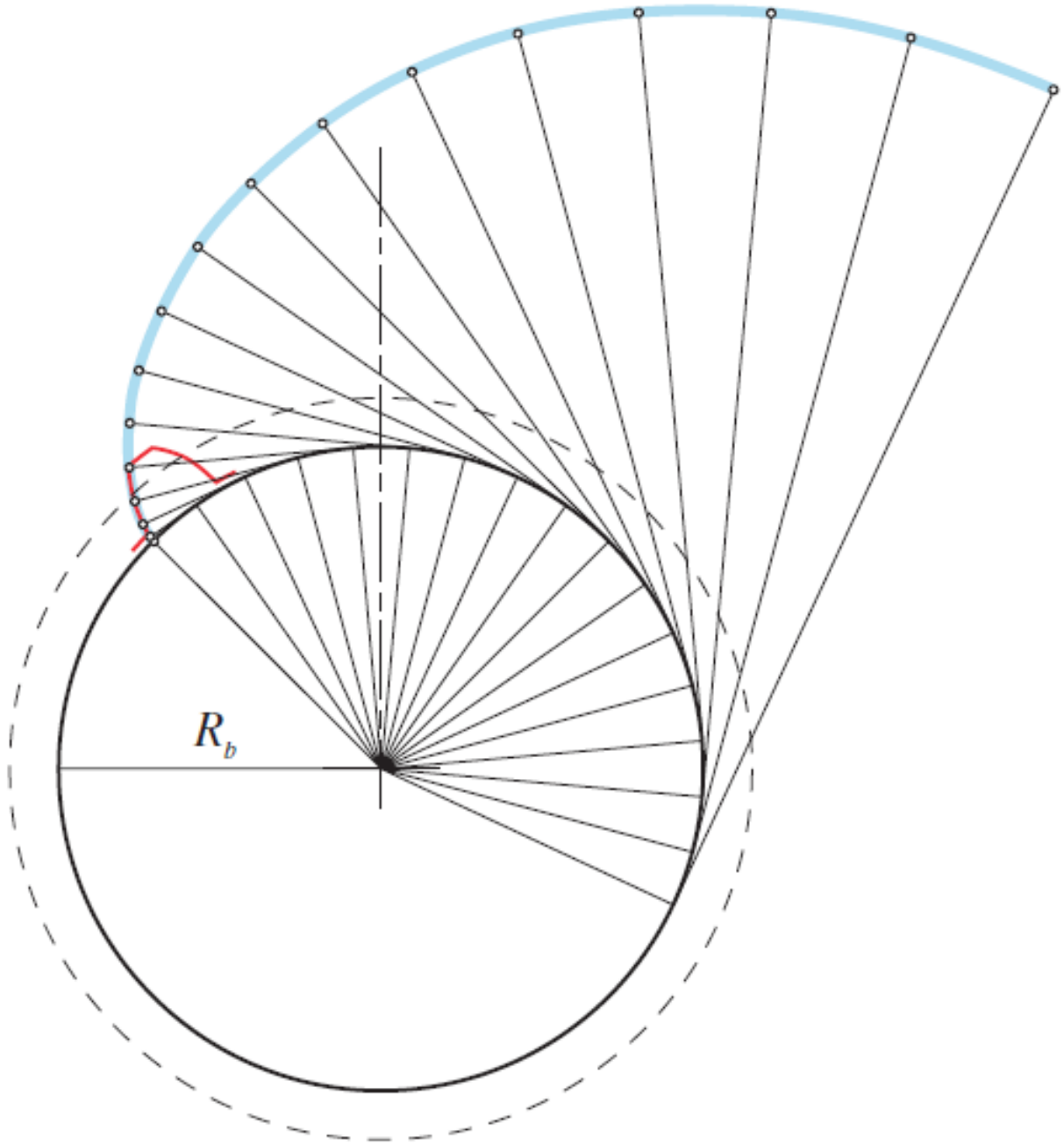

3 P
4 P
5 P
6 P
7 P
8 P
20 P
18 P
16 P
14 P
12 P
10 P
9 P

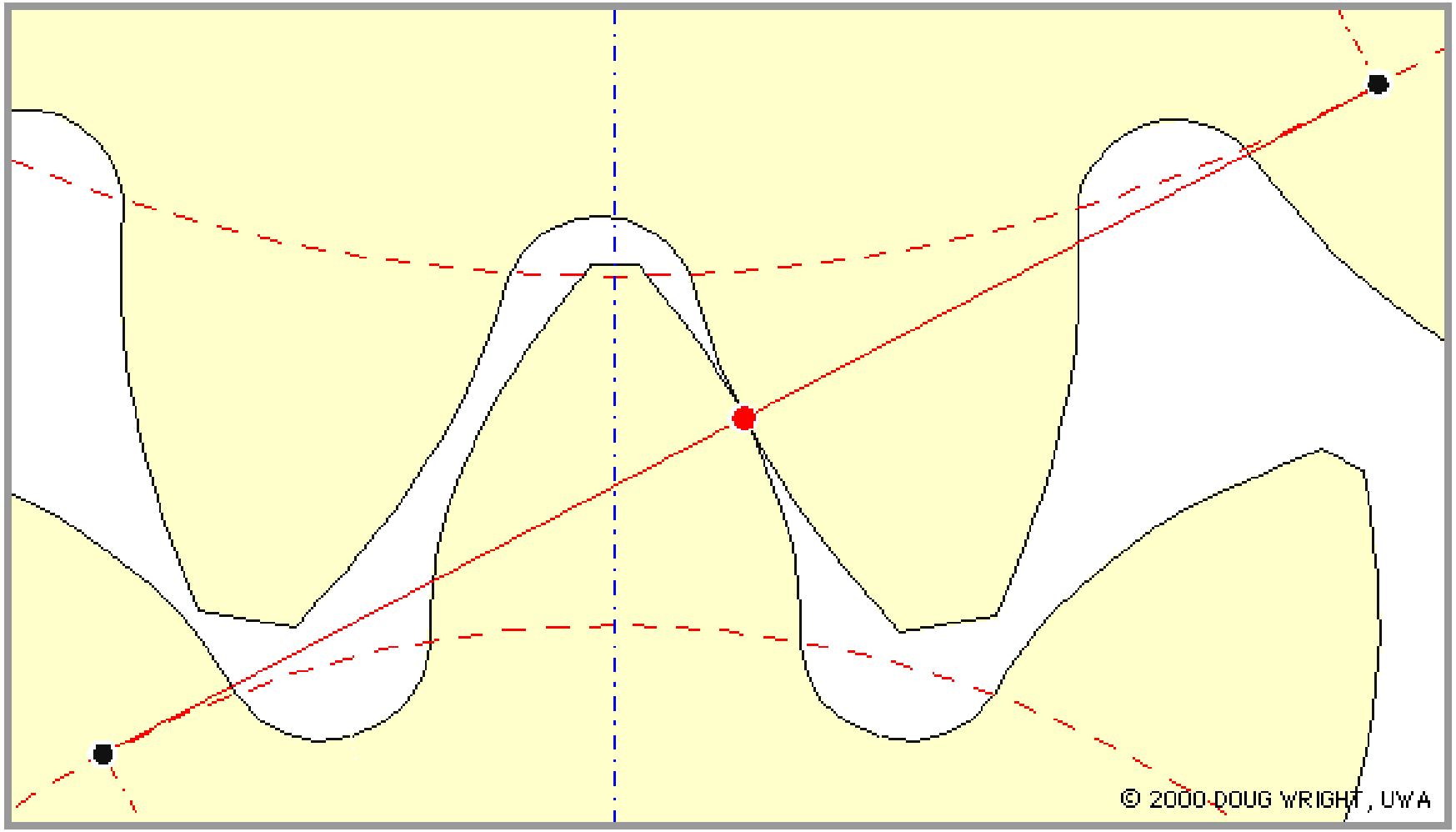
8
7
6
5
4
14
12
26
11
10
9
22
24
20
18
16
64
48
40
36
32
30
28
80

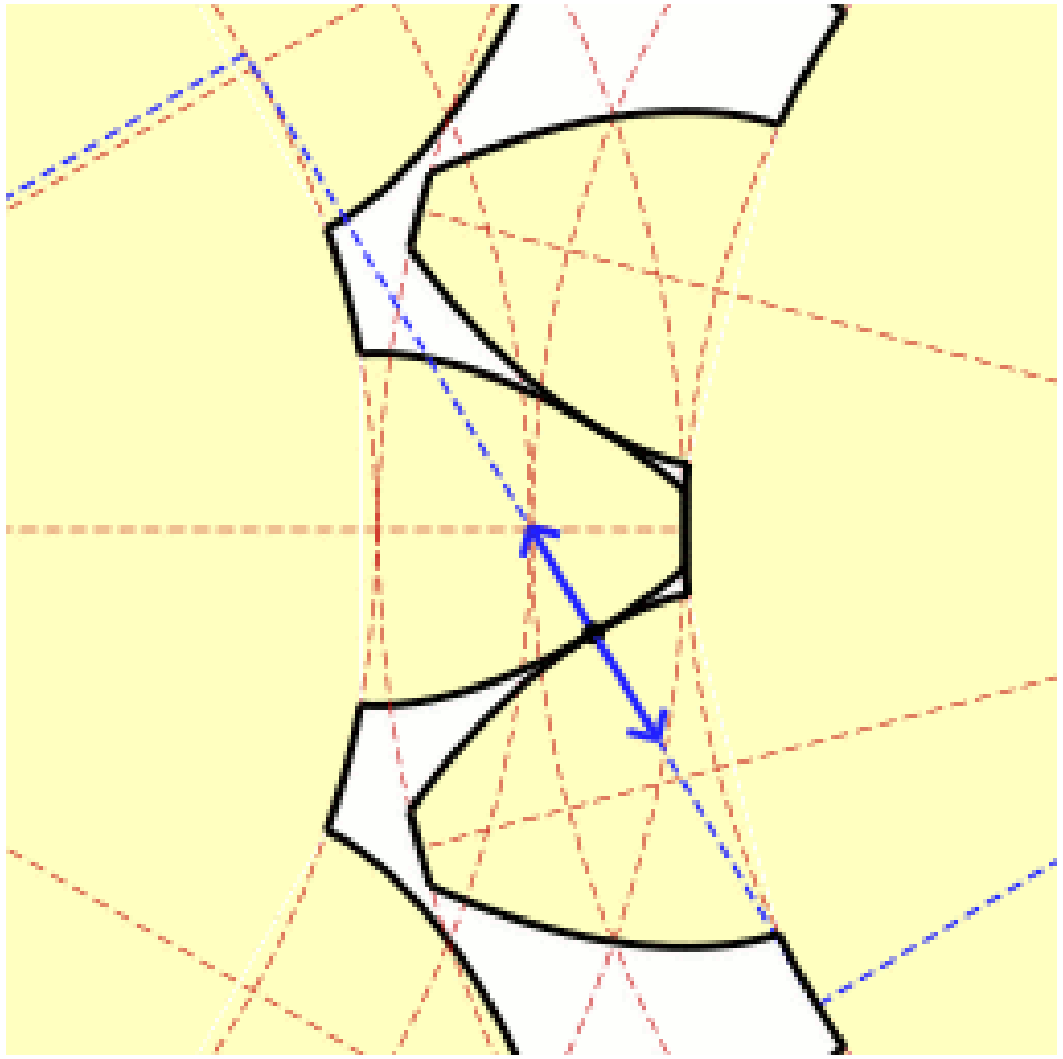

line of action
r_b
r
(to pitch point)
ϕ
pitch point
contact point
(moves along line of action)
R
(to pitch point)
ϕ
R_b
base circles
pitch circles


ϕ
r_b
r
contact point
F_n
R
R_b




R_b


© 2000 DOUG WRIGHT, UWA



J, K: Initial & final points of contacts

L, M: Points of tangency of line of action with base circles

Z: Length of line of action

$$Z = \overline{JK} = \overline{JP} + \overline{PK} \quad (1)$$

$$\overline{JP} = \overline{JM} - \overline{PM} \quad (2)$$

Consider the two triangles on pinion side: BMJ & BMP.

From triangle BMJ:

$$\overline{JM} = \sqrt{\overline{BJ}^2 - \overline{BM}^2} \quad = \sqrt{(r_p + a_p)^2 - (r_p cos\emptyset)^2} \quad (3)$$

From triangle BMP:

$$\overline{PM} = \overline{BP} sin\emptyset = r_p sin\emptyset \quad (4)$$

Substitute (3) & (4) in (2):

$$\overline{JP} = \sqrt{(r_p + a_p)^2 - (r_p cos\emptyset)^2} - r_p sin\emptyset \quad (5)$$

Similar procedure on gear side. Consider triangles: ALK & ALP will result in:

$$\overline{PK} = \sqrt{(r_g + a_g)^2 - (r_g cos\emptyset)^2} - r_g sin\emptyset \quad (6)$$

Noting that $a_p = a_g = a$ and $\left(r_p + r_g\right) = C$ (7)

Substituting (5), (6), and (7) in (1):

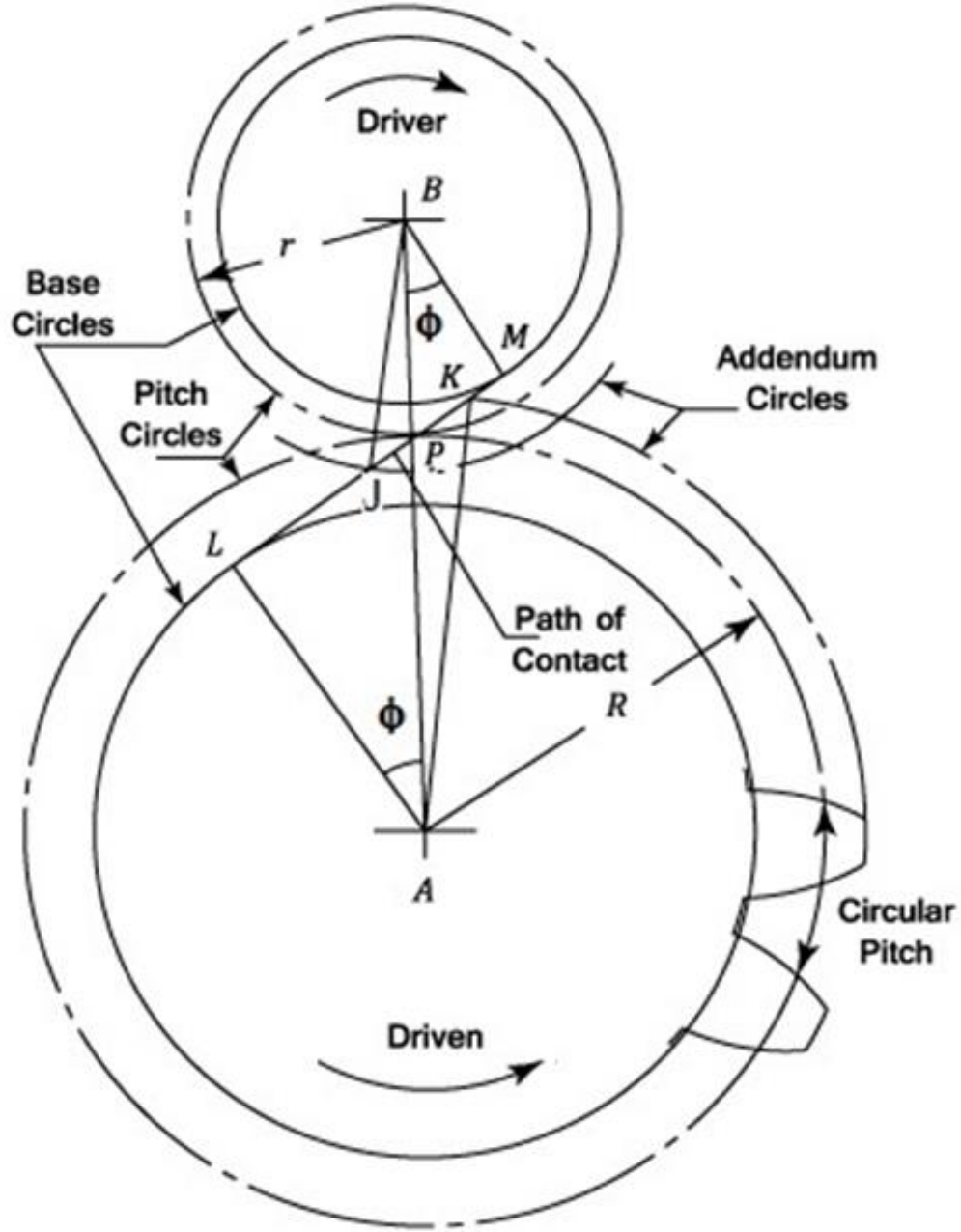
$$Z = \sqrt{(r_p + a)^2 - (r_p cos\emptyset)^2} + \sqrt{(r_g + a)^2 - (r_g cos\emptyset)^2} - Csin\emptyset$$

OR:

$$Z = Z_1 + Z_2 - Z_3$$

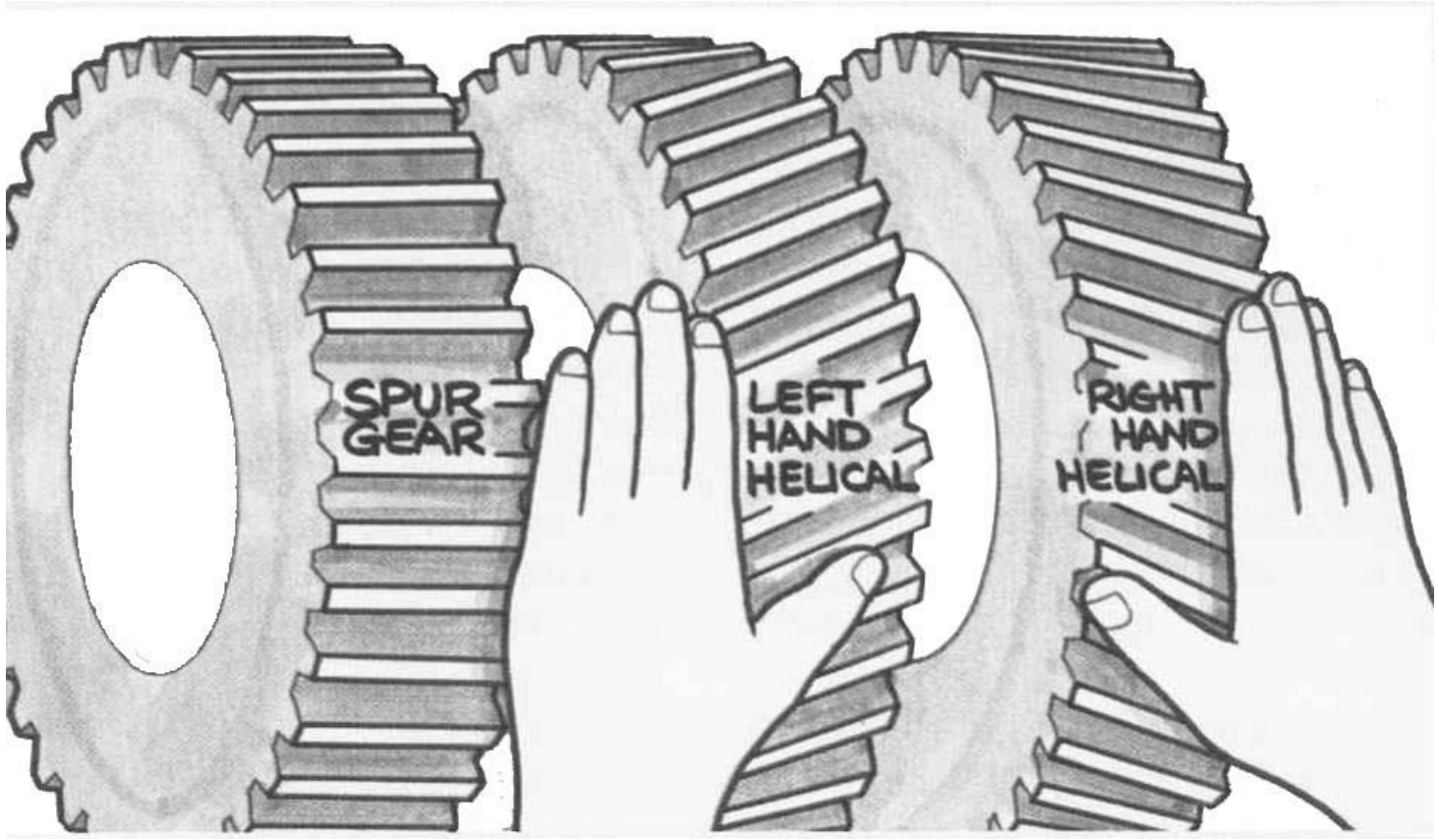
Where:

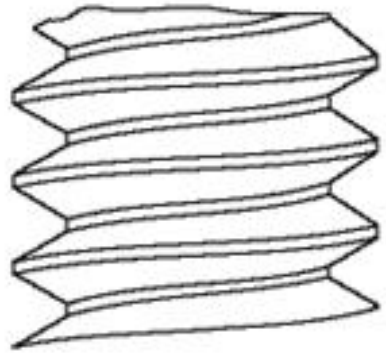
$$Z_1 = \sqrt{(r_p + a)^2 - (r_p cos\emptyset)^2} \qquad Z_2 = \sqrt{(r_g + a)^2 - (r_g cos\emptyset)^2} \qquad Z_3 = Csin\emptyset$$

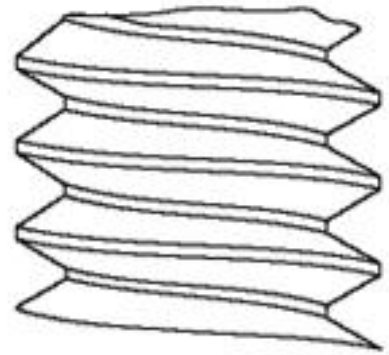


Left Hand

Right Hand

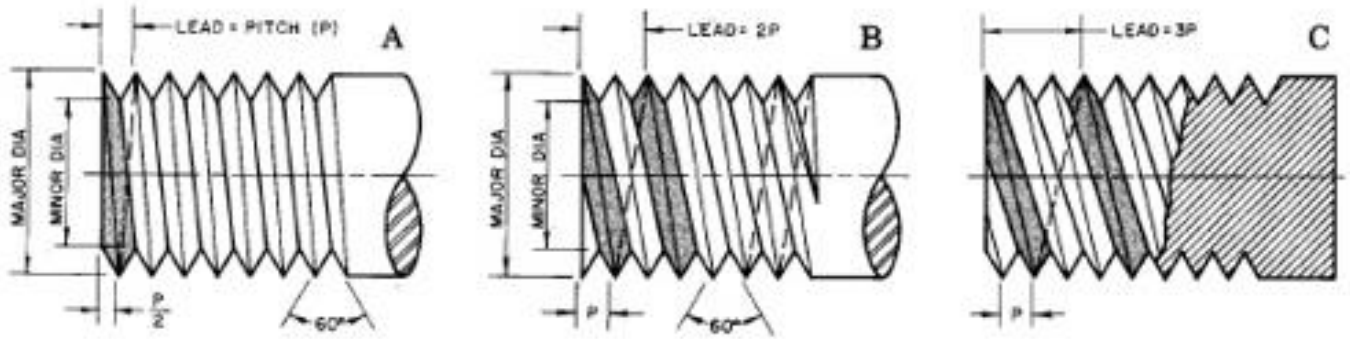




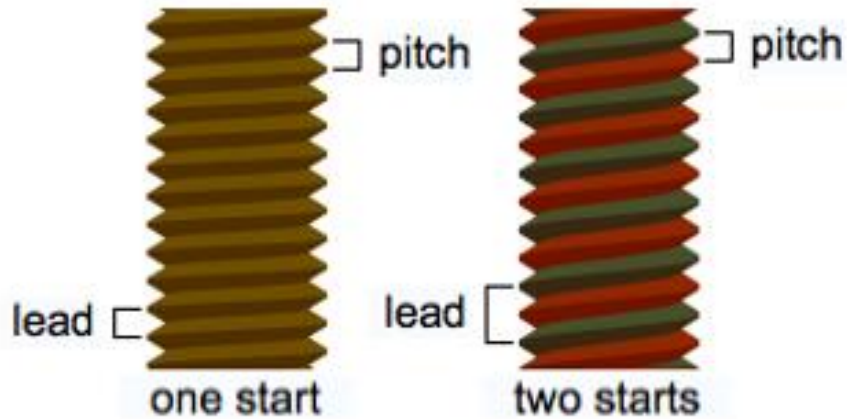


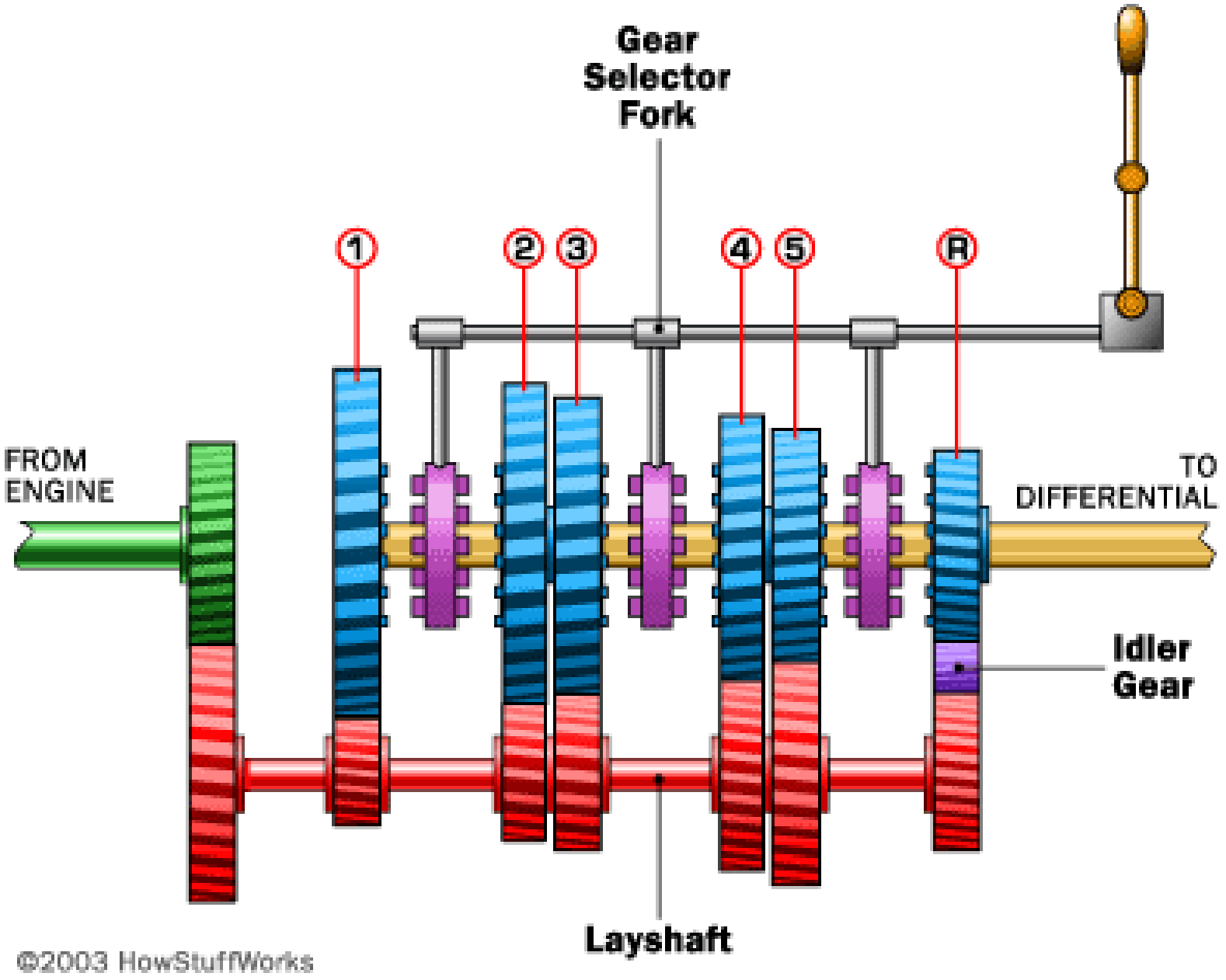
Right-Hand Thread

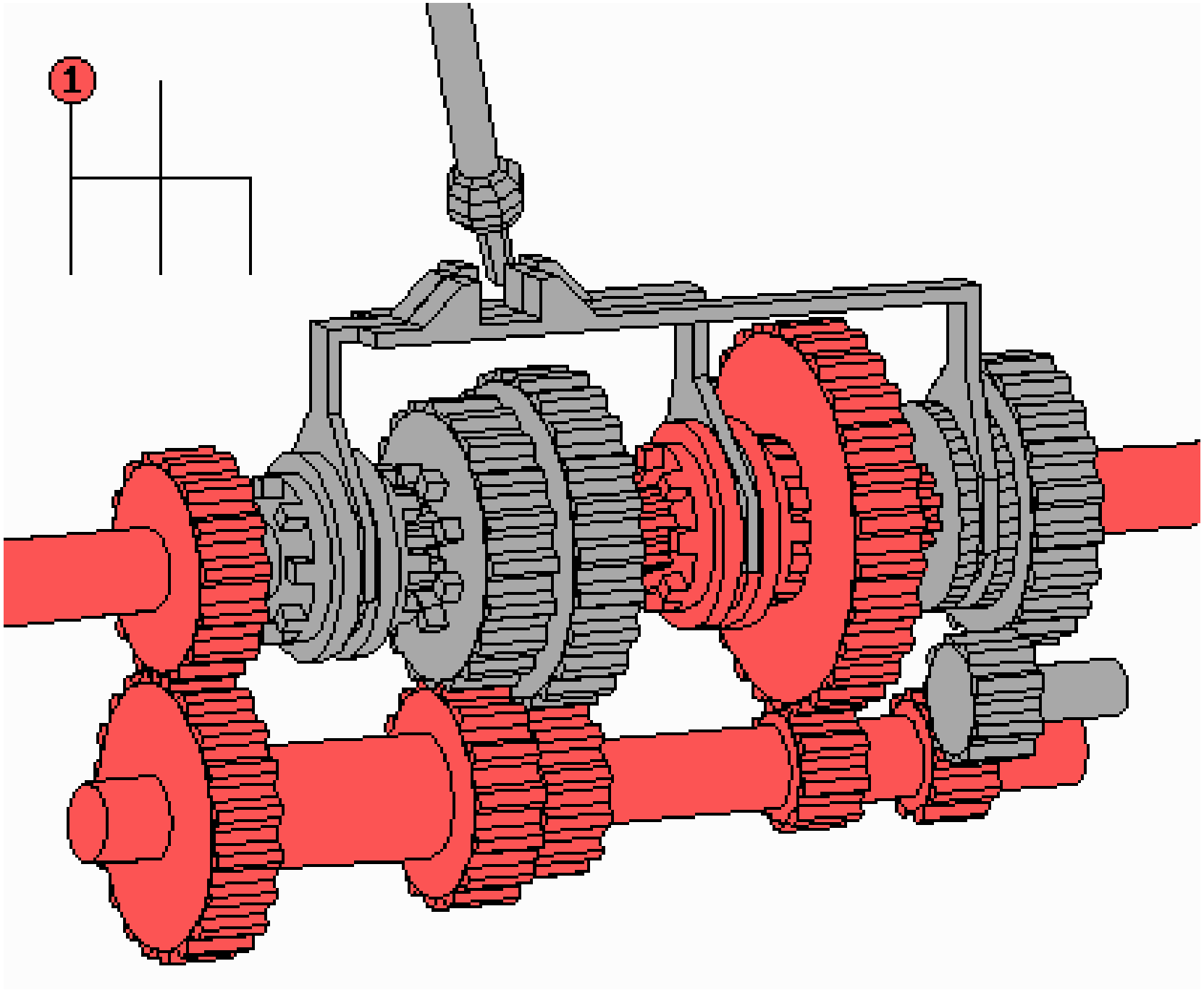
Left-Hand Thread



Single Thread **Double Thread** **Triple Thread**




Gear
Selector
Fork
1
2
3
4
5
R
FROM
ENGINE
TO
DIFFERENTIAL
Idler
Gear
Layshaft
©2003 HowStuffWorks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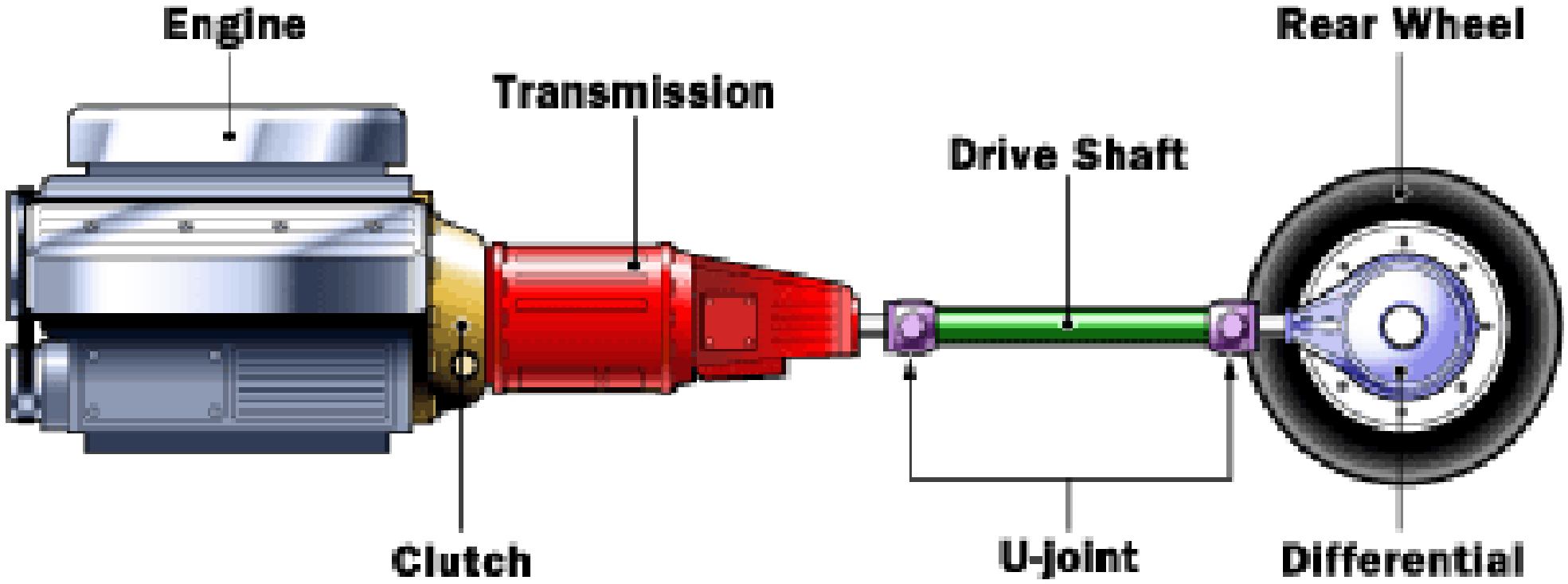
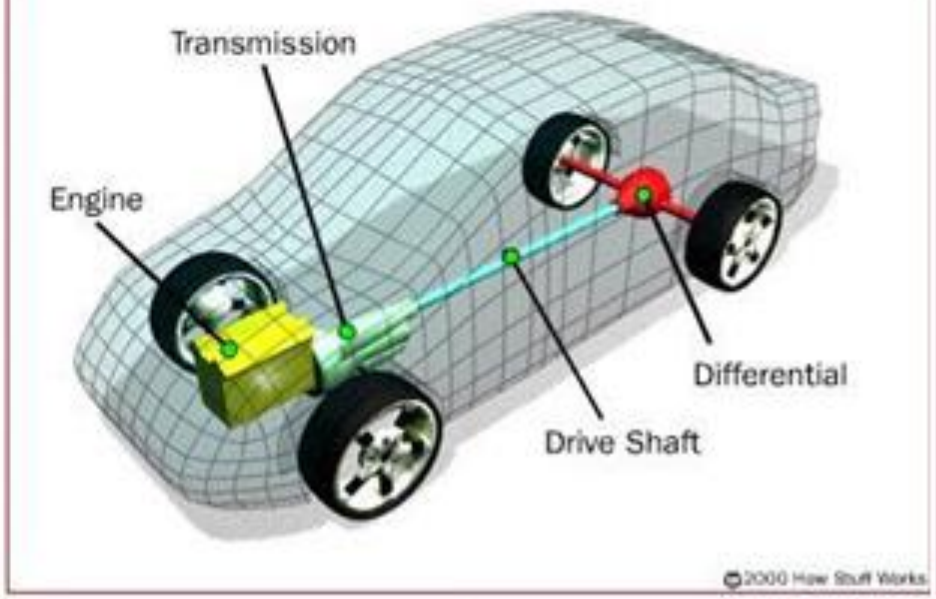
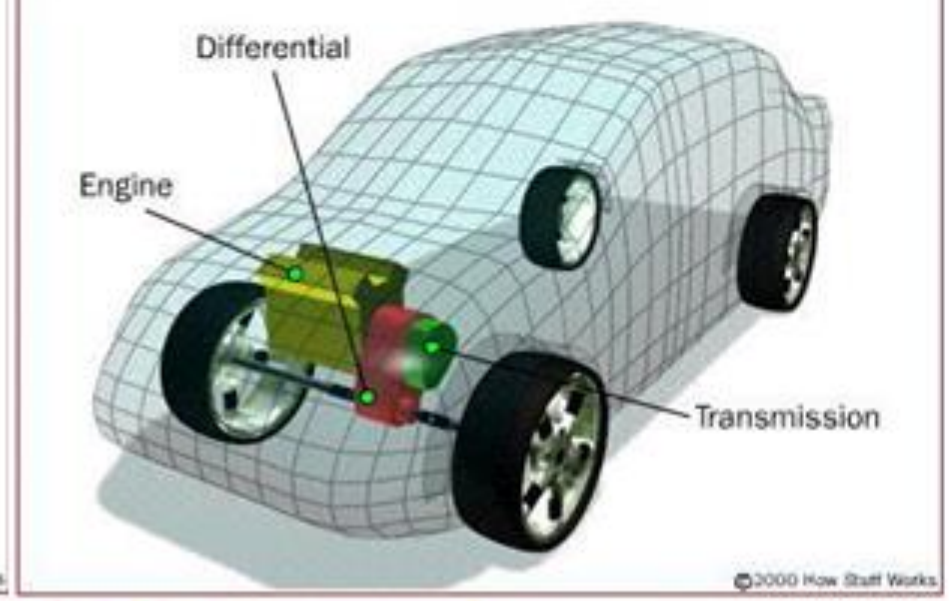
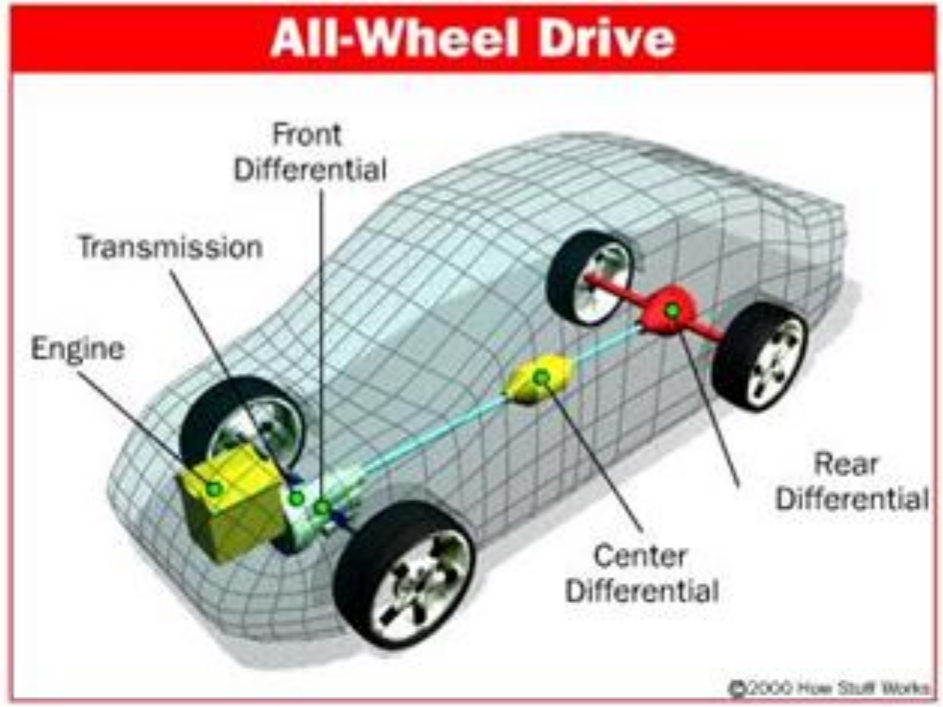

Engine
Transmission
Drive Shaft
Rear Wheel
Clutch
U-joint
Differential

Rear-Wheel Drive



Front-Wheel Drive



All-Wheel Drive