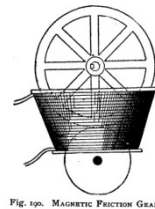


# I-Linking in Technical Objects

1. What is linking? Give examples.

It's the connection between two mechanical parts. Examples:

- Hammer-handle and head
- Calculator case and calculator
- Brush hair and handle on paintbrush



## 2. Characteristics of Links

- A) Direct versus Indirect Links. What's the difference?
- A direct link only features the two parts being joined. An indirect link has a third part that helps link them together.

**Examples** Classify as direct or indirect.

a) Link between tire and wheel

b) link between blade and shoe

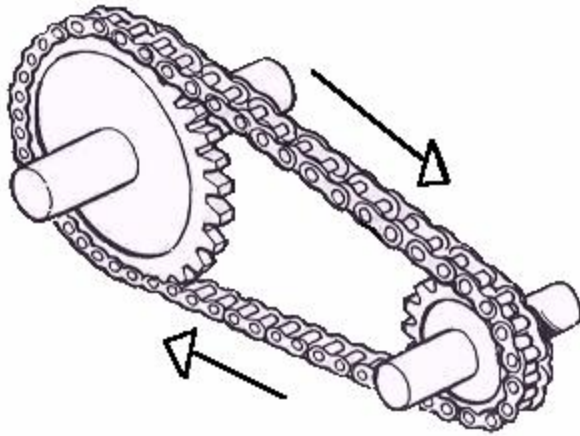
direct



indirect(screw)

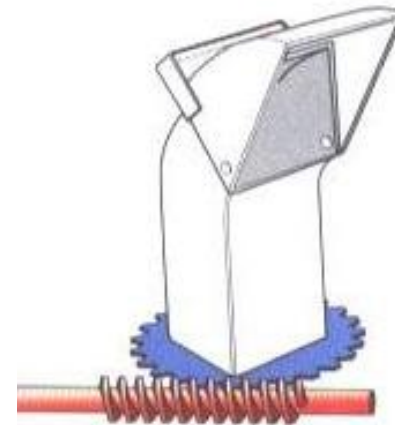
**More Examples** Classify as direct or indirect.

c) The link between the two gears



Indirect (chain)

d) The link between the two gears



direct

B) Rigid versus Flexible Links. What's the difference?

The rigid link cannot be bent. The flexible link is bendable like rubber.

**Examples** Classify as rigid or flexible.

a) Link between tire and wheel



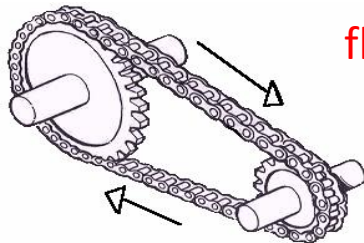
flexible

b) link between blade and shoe



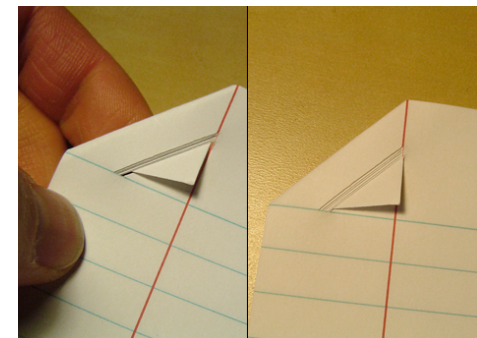
rigid

c) The link between the two gears



flexible

d) The link between the two papers



flexible

C) Removable versus Nonremovable Links. What's the difference from the point of view of destruction?

The rigid link cannot be bent. The flexible link is bendable like rubber.

Examples Classify as removable or nonremovable.

a) Link between tire and wheel



removable

b) link between blade and shoe



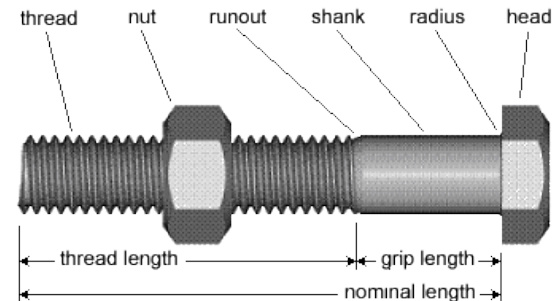
removable

c) Link between shoe top and sole



Non removable

d) link between nut and bolt



removable

D) Complete Versus Partial Links. What's the difference?

A partial link allows one component to move without necessarily moving the other. A complete link has both parts moving together.

**Examples** Classify as complete or partial links and explain why.



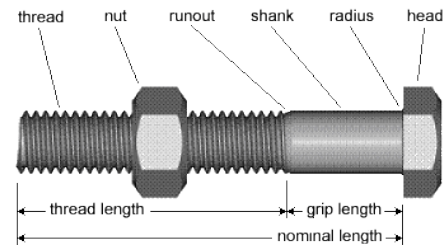
Complete



complete



Partial; wheels can turn without having the shoe move



Partial; nut can turn without having the bolt move

# II-Transformation Systems: these turn rotational motion into a translation or vice versa

1) Rack (straight part) and Pinion convert rotational motion into linear motion(translation)

a) Where is this system found?

In conveyor belts ; in steering systems and in new wine-bottle openers



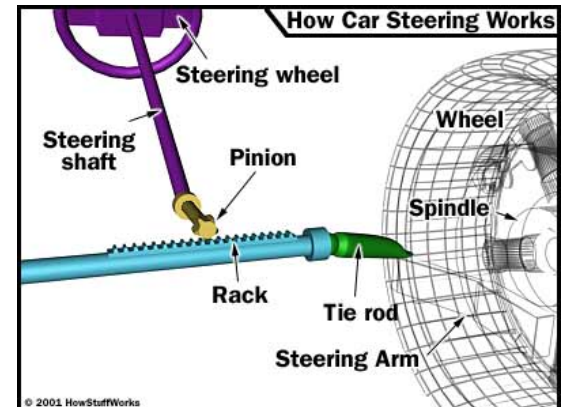
a) Characteristics

(1) Teeth must mesh

(2) To prevent wear and tear, the system needs to be lubricated

(3) What can be done to pinion to slow movement of rack? (in steering wheel)

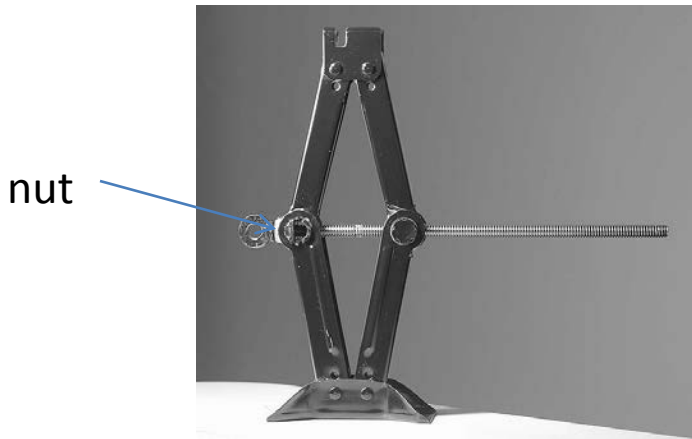
Have less teeth



## 2) Screw Gear System

a) What are the two types of screw gear systems?

Car jack and wrench



### b) Characteristics

(1) Can the nut rotate with the screw in the jack? \_\_\_\_\_

No

(2) In which system(s) should the screw's threads match those of the nut? \_\_\_\_\_

both

(3) In the wrench is the nut being held in place? \_\_\_\_\_

yes



3) Cam and Follower System: the “follower” part has a repetitive up and down motion. The cam is the teardrop shape.

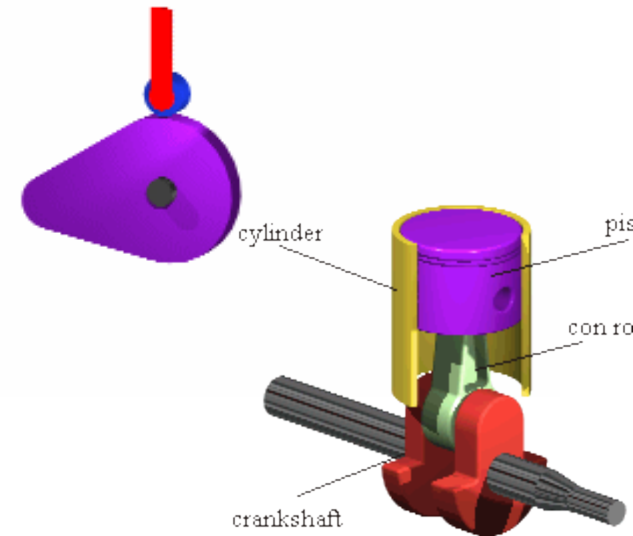
A) Where is this system used?

In engines to open and close valves and also in toys where the head goes up and down.

A) Characteristics

- (1) Must the follower be “guided?”
- (2) Is the cam’s shape important?
- (3) How do you make sure that the cam and follower remain in contact

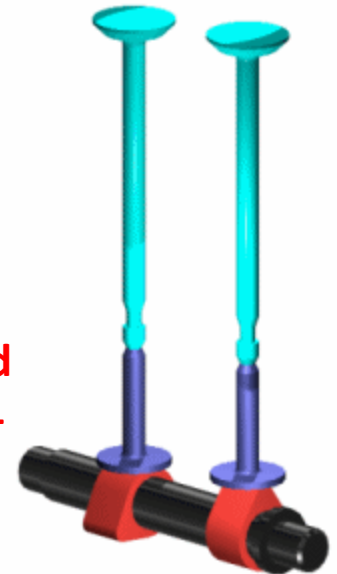
A partial link is needed.

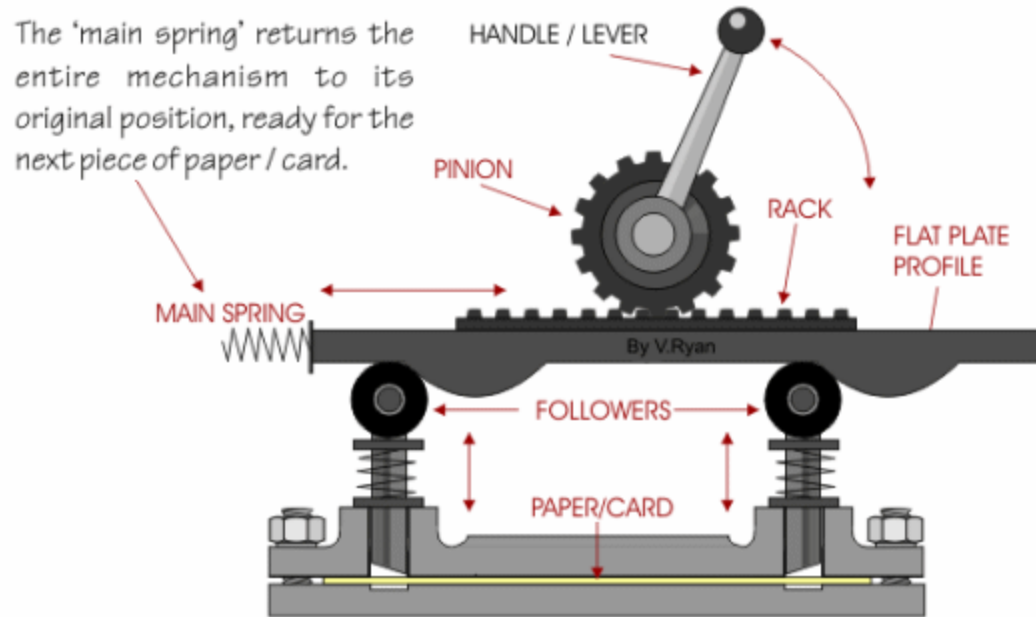


(1) Yes

(2) yes.

Without the tear drop part , the follower would not move up. But in toys you could make the cam circle-shaped but off-centered and it will have the same effect.





In the above, the lever turns the pinion, which moves the rack. The rack is the top part of a cam-follower system. When the teardrop part moves over the round follower, it presses it down, and this punches holes into the card. Because of the distance travelled by the rack, it lowers the force needed to do the same work that would be required with a simpler but inferior setup.

4) Slider-Crank System: an up and down motion of a piston is turned into a circular motion

A) Where is this system used?

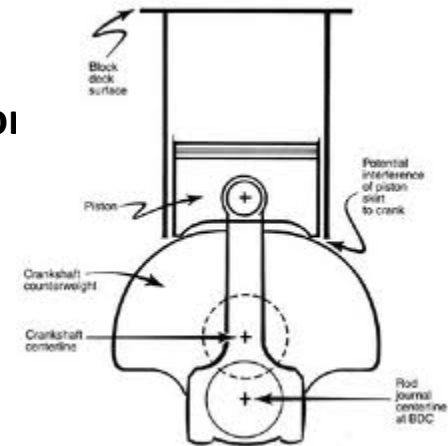
B) Characteristics

(1) What connects the piston to the crank? \_\_\_\_\_

(2) What part of the engine keeps the piston in place (“guides it”)? \_\_\_\_\_

(3) How do you prevent wear and tear between the guiding part and the piston?

1) **arm or rod** 2) **cylinder** 3) **By lubricating it with oil**



A) It's what makes a car engine work. The hot gases from the combustion of gasoline push the piston, which eventually powers the wheels to turn.