

Cams

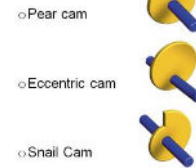
A cam is a shaped piece of metal or plastic fixed to a rotating shaft. A **cam mechanism** has three parts: **cam**, **slide** and **follower**.

The cam shaft **rotates** continually, turning the cam. The follower is a rod that rests on the edge of the turning cam. The follower is free to move up and down, but is prevented from moving from side to side by a slide or guide, so the follower can only do three things:

1. **Rise** (move up)
2. **Fall** (move down) or
3. **Dwell** (remain stationary)

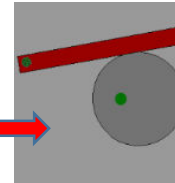
The follower's pattern of movement depends on the profile or outside edge of the cam that it follows

Three common types of cams:-



Cams come in a variety of shapes and sizes - the most common types snail shaped, pear shaped and a circular with an off-centre hole. As the cams rotate, the followers reciprocate motion according to the profile of each cam. Cams that have a pear shape will cause the follower to lift, to fall and then to pause before repeating the action. The cams that have a circular shape, sometimes referred to as eccentric cams, will cause a smooth rise and fall movement with no pause.

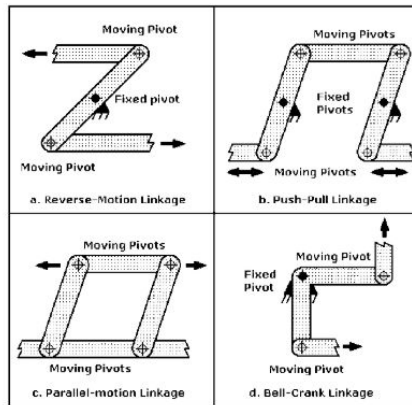
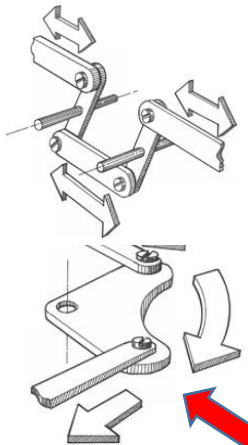
What type of movement would be created when you add a lever instead of a follower?



Cams - Lift, fall and dwell. Cams can provide a lift (when the follower is moving up), fall (when the follower is moving downwards and dwell (when the follower is not moving).



A **mechanical linkage** is an assembly of bodies connected to manage forces and movement. The movement of a body, or link, is studied using geometry so the link is considered to be rigid. Reverse Motion linkage systems Reverse motion linkages can be used to change the direction of motion. This is useful for changing a push into a pull, or visa-versa.



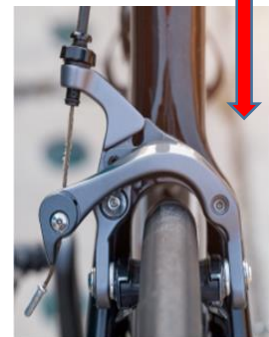
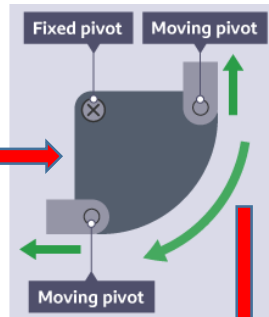
Simple Planar Linkages by Function

Reverse-Motion Linkage, Fig.a, can make objects or force move in opposite directions; this can be done by using the input link as a lever.

Push-Pull linkage, Fig.b, can make the objects or force move in the same direction; the output link moves in the same direction as the input link.

Parallel-Motion linkage, Fig.c, can make objects or forces move in the same direction, but at a set distance apart.

Bell-Crank linkage, Fig. d, can change the direction of objects or force by 90°.



Bell and Crank systems

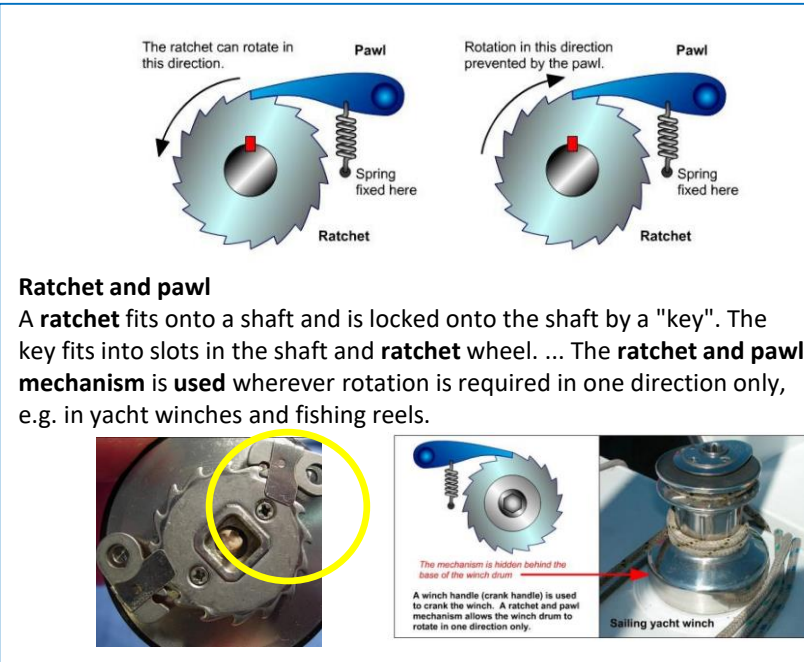
Linkages are very important in mechanical control systems because they allow forces and motion to be transmitted where they are needed. They can change the direction of a movement, the size of a force, or make things move in a particular way. They usually do several of these things at once. Bell cranks are used to change the direction of motion through 90 degrees. This is useful for taking motion round a corner. The picture shows the calliper brakes on a bicycle. The mechanism is made up of two bell cranks, both pivoting on the same bolt. By changing the position of the fulcrum or lengthening one side of the lever, the amount of movement or the size of the forces produced by the linkage can also be changed. In fact you cannot change one without changing the other. The brakes used on mountain bikes have much longer levers on the effort side of the fulcrum than those on a standard bike. This allows larger forces to be applied to the wheel when braking.

Crank and Slider

A crank is a device through which rotary motion and torque can be applied to a shaft. The simplest device is a crank handle. When a number of cranks are incorporated into a shaft, it is called a crankshaft. The most common application of the crankshaft is in the motor car engine. A crankshaft, connecting rod and piston, is one example of a crank and slider mechanism.

In the car engine the **reciprocating motion** of the piston caused by exploding fuel is converted into **rotary motion** as the con-rod moves the crankshaft around.

An air compressor uses this principle in reverse - an electric motor turns the crankshaft and the piston moves up and down to compress the air.



Ratchet and pawl

A **ratchet** fits onto a shaft and is locked onto the shaft by a "key". The key fits into slots in the shaft and **ratchet wheel**. ... The **ratchet and pawl mechanism** is **used** wherever rotation is required in one direction only, e.g. in yacht winches and fishing reels.



- Cams
- Follower
- Slider
- Rise
- Fall
- Dwell
- Eccentric
- Rotation
- Reciprocating
- Linkage
- Fulcrum
- Bell crank
- Crank and slider
- Ratchet and Pawl
- Revers motion linkage
- Forces



Try to find products around your house that use mechanisms. If you can explain what the product does and how the mechanism works then you will be going in the correct direction.

Remember to use the correct terminology for movements

Title: Mechanisms Cams

Design and Technology