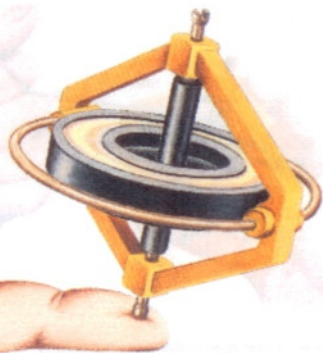




SPACE WONDER®

ITEM 6010/CB



An object which revolves round an axis is a gyroscope. The earth, a bicycle wheel, the rotor of an electric motor are all gyroscopes.

How it is made

The gyroscope consists of a body rotating round an axle, called a gyro wheel. It is held in its frame by two pivots.

How it is used

1. Thread a loop of this cord into the hole in the axle of the gyroscope.
2. Turn the axle until the cord is almost completely wound round it.
3. Hold the gyroscope as shown in the figure and pull the cord.

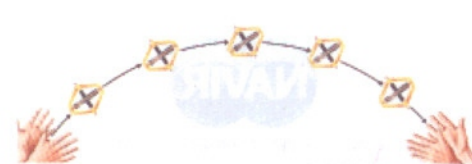
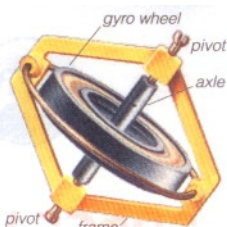


Warning

- Do not touch the gyro wheel with your fingers
- Do not let the cord get wound round the pivot
- Do not pull the cord jerkily but with a smooth steady action
- Do not let the gyroscope fall onto the floor (it should be used on a table or something soft)

Characteristics of gyroscopes

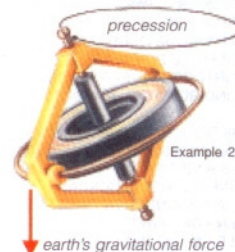
Gyroscopes have two basic characteristics. **Gyroscopic inertia.** The axle of a rotating gyroscope tends to remain orientated in the same direction.



Example 1. If we throw a gyroscope to someone a few meters away, the axle will remain pointing the same way along the whole trajectory.

Gyroscopic precession. If a force is applied to a rotating gyroscope, its axle does not move in the same direction as the force, but at right angles to it.

Example 1. If we hold a rotating gyroscope in our hands and try to move its axle in a certain direction, the gyroscope will tend to move in a different direction (perpendicular) and feels as though it is slipping out of our hands.



Example 2. The earth's gravitational force tends to cause the gyroscope to fall but the latter undergoes precession.

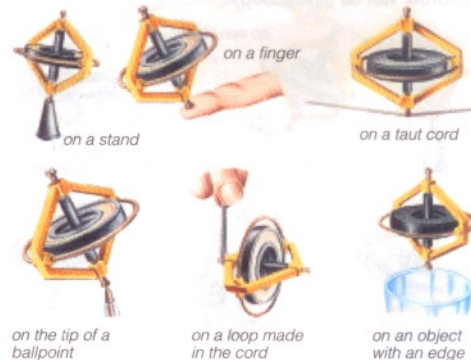
Example 3. The attraction of the moon and sun on the earth whose diameter is greater at the equator generates a precessional movement with a cycle of approximately 25,800 years.

Example 4. If we turn the handle-bars of a moving bicycle to the right, the wheel and the bike lean over to the left (thanks to gyroscopic precession) thus enabling us to turn left. At low speeds on the other hand, when the gyroscopic effect is minimal, turning the handle-bars to the right we turn right.

The two characteristics of the gyroscope which we have been considering (inertia and precession) become proportionally more evident, as the speed of rotation, the weight of the gyro wheel and the distance of the gyro wheel from the axis of rotation all increase.



Examples of the gyroscope's use



In all these situations (and in many others you might like to devise) the gyroscope remains in its steady state due to its chief property: gyroscopic inertia.

Before long however the earth's gravitational force causes precession to set in and the gyroscope's axis orientation varies and it rotates.

As the speed of rotation decreases, the gyroscopic effect becomes increasingly less evident until the gyroscope turns back into an 'ordinary' object and it falls.

Technical applications

Gyroscopes have very important technical applications.

Aeroplane and missile guidance systems are all based on one or more gyroscopes, as are artificial horizons and other devices on aeroplane instrument panels. Ships are stabilised by huge gyroscopes.

Maintenance

Play. The axle must be mounted in the frame in such a way that it has some play. Play can be adjusted by regulating the grooved pivot with a screwdriver.

Lubrication. Friction can be reduced by lubricating the two pivots with a little drop of oil from time to time.



artificial horizon



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