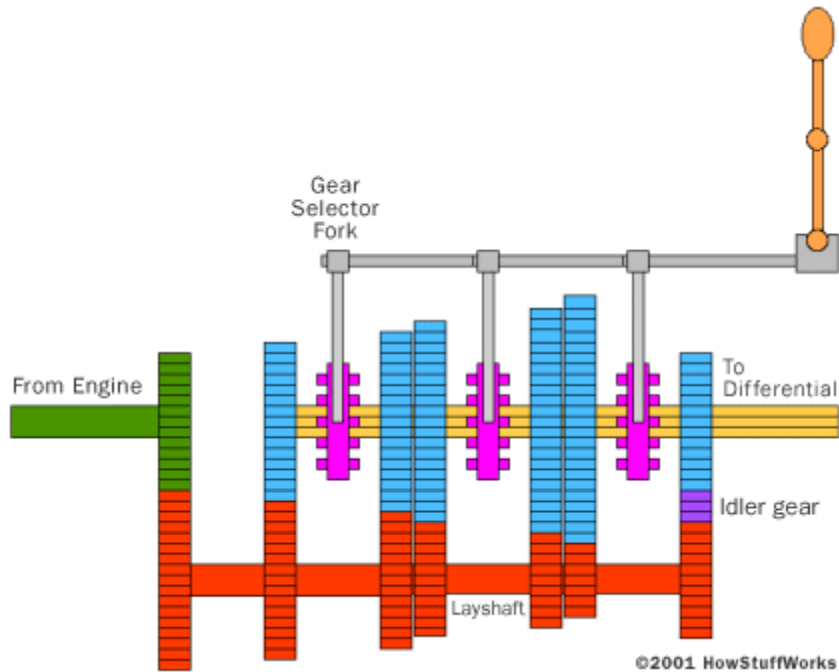


How Sequential Gearboxes Work



In the Gearbox

[How Manual Transmissions Work](#) offers a basic understanding of the mechanisms inside a manual transmission. The **five-speed manual transmission** is fairly standard on cars today. It looks something like this internally:

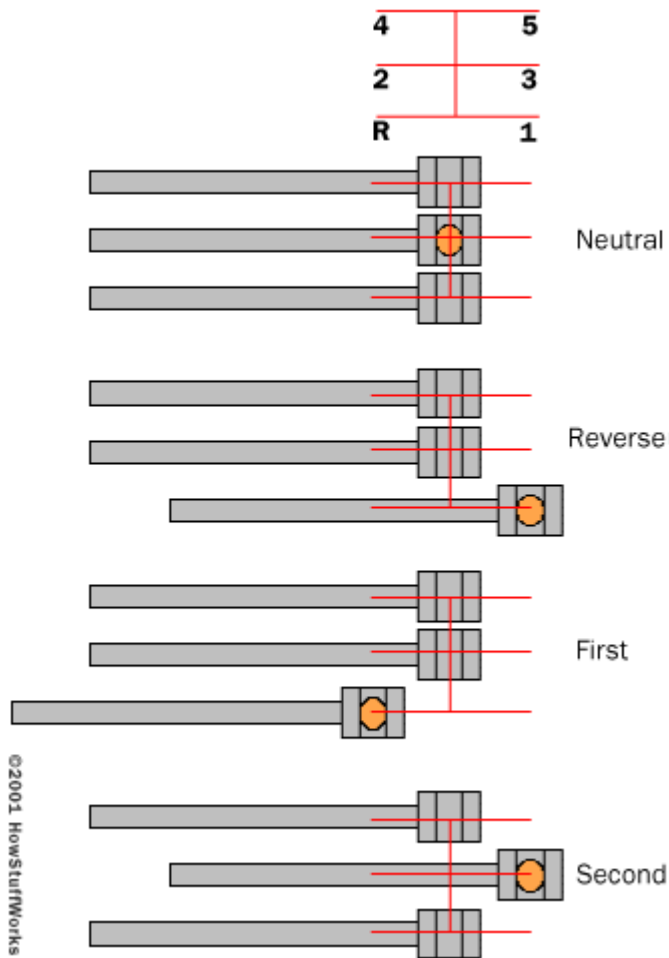
There are three forks controlled by three rods that are engaged by the shift lever. Looking at the **shift rods** from the top, they look like this in neutral, reverse, first and second gear:

The "H" pattern allows you to move the shift rod between the control rods for the three forks and move the rods back and forth.

A sequential manual transmission works the same way. There is still a set of **gear selector forks** that move collars that engage gears. The only difference is the way the control rods are manipulated. The "H" pattern is eliminated and replaced with a different motion.

In a race car, the motion of the shift lever is either "push forward" to up-shift or "pull backward" to downshift. If you are in a gear and you want to go to a higher gear (e.g. from 2nd to 3rd), you push the shift lever forward. To go from 3rd to 4th, you push the lever forward again. To go from 4th to 5th, you press it forward again. It is the same motion every time. To drop back down a gear, say from 5th to 4th, you pull the lever backward. In European mass-produced automobiles, the shift lever moves forward and backward to shift into higher and lower gears, respectively. In Formula One cars, there are actually two paddles on the sides of the steering wheel, instead of a

shift lever. The left paddle up-shifts, while the right paddle downshifts. On a motorcycle, you do the same thing, but instead of moving a lever back and forth with your hand, you move a lever up and down with your foot.



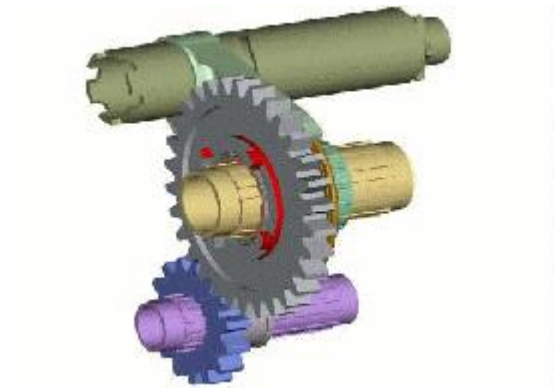
What these motions are doing is rotating a **ratcheting drum**. The drum looks like this:



You can see that there are grooves cut into the drum. These grooves can do one of two things:

- If the drum is located away from the transmission's gears, the grooves control standard control rods.
- If the drum is located next to the gears, the grooves directly move the gear selector fork, and no control rods are needed. This seems to be the more common technique because it has fewer parts and is more compact.

So, when you move the lever, it rotates the drum one increment (for example, 50 degrees). This rotation causes the rods or forks to move according to the grooves in the drum, changing the gears.



Animation of six-speed sequential transmission

Photo courtesy [Mike Challenger, Hayndesign Ltd](#)

Because of the drum, you have to shift **in sequence**. There is no skipping, for example, from first gear to third. You must always go through second gear to get to third gear. It is the same when downshifting. The advantage of this system is that shifting mistakes are impossible. You always go to the next gear.

These details from

www.howstuffworks.com