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What lubricates a manual transmission

When you shift gears in your manual-transmission car, you move a rod that moves a fork that engages the gear. Depending which gear you're shifting to, a different fork does the job. The fork moves the collar to the desired gear, and dog teeth on the collar mesh up with holes on the gear in order to engage it. You engage reverse gear through a separate, small idler gear. The reverse gear always turns in the opposite direction of the other (forward) gears.In years past, double-clutching was common in order to disengage a gear, allow the collar and next gear to reach the same speed, and then to engage the new gear. To double-clutch shift, you pushed the clutch pedal to free the engine from the transmission. Then the collar moved into neutral. You released the clutch and revved the engine to get it to the right rpm value for the next gear so the collar and the next gear spun at the same rate to allow the dog teeth to engage the gear. When the engine hit the right speed, you depressed the clutch again in order to lock the collar into place, on the next gear.Modern cars use synchronizers in order to avoid the need for double-clutching. A synchronizer, or "synchro," lets the collar and gear synchronize their speeds while they're already in contact but before the dog teeth engage. Each manufacturer's synchro is slightly different than the others, but the basic idea is the same. For instance, a cone on one gear will fit into a cone-shaped depression on the collar. The gear and collar synchronize their speeds thanks to the friction between the cone and collar. Then the outer part of the collar moves out of the way so that the gear can be engaged by the dog teeth. Four-speed manual transmissions are largely outdated, with five- and six-speed transmissions taking their place as the more common options. Some performance cars may offer even more gears. However, they all work more or less the same, regardless of the number of gears. Internally, it looks something like this: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 reverse, first and second gear:Keep in mind that the shift lever has a rotation point in the middle. When you push the knob forward to engage first gear, you are actually pulling the rod and fork for first gear back.You can see that as you move the shifter left and right you are engaging different forks (and therefore different collars). Moving the knob forward and backward moves the collar to engage one of the gears.Reverse gear is handled by a small idler gear (purple). At all times, the blue reverse gear in this diagram above is turning in a direction opposite to all of the other blue gears. Therefore, it would be impossible to throw the transmission into reverse while the car is moving forward; the dog teeth would never engage. However, they will make a lot of noise.SynchronizersManual transmissions in modern passenger cars use synchronizers, or synchros, to eliminate the need for double-clutching. A synchro's purpose is to allow the collar and the gear to make frictional contact before the dog teeth make contact. This lets the collar and the gear synchronize their speeds before the teeth need to engage, like this:The cone on the blue gear fits into the cone-shaped area in the collar, and friction between the cone and the collar synchronize the collar and the gear. The outer portion of the collar then slides so that the dog teeth can engage the gear.Every manufacturer implements transmissions and synchros in different ways, but this is the general idea. Hemera Technologies/AbleStock.com/Getty Images The most obvious difference between a 5-speed and a 6-speed manual transmission is the number of speeds: A 5-speed has five different gears and a 6-speed has six. Until very recently, most consumer automobiles mass-produced with manual transmissions tended to be 5-speeds. Only higher-end cars with more powerful engines and finer-crafter compoars tended to have 6-speeds. Since the late 1990s, cars that are not considered high-performance autos have largely been manufactured with 6 speeds. These are generally autos designed to be more energy efficient. In recent 6-speeds, the extra speed from a 5-speed allows the engine to run at a lower RPM and save fuel, comparatively. This difference is most effective at highway driving speeds. Whereas in a 5-speed, drivers are advised to accelerate above 25mph in fourth gear, in a 6-speed car, drivers are advised to accelerate above 35mph in fifth gear. As manual shifting is a fairly intuitive skill set, there is no easy advice for a driver who is changing from a 5-speed car to a 6-speed. The driver just needs to develop a feel for the engine and be able to work out the changes for herself. The purpose of the transmission in an automobile is to transfer the power created by the engine to the wheels via a drive shaft or half-axes. Differing gears in the transmission allow for different levels of torque to be applied to the wheels depending on the speed at which the vehicle is traveling. In order to change the level of torque the gears in the transmission need to be shifted either manually or automatically. In the beginning all transmissions were manual. French inventors Louis-Rene Panhard and Emile Levassor are credited with the development of the first modern manual transmission. They demonstrated their three-speed transmission in 1894 and the basic design is still the starting point for most contemporary manual transmissions. Panhard and Levassor used a chain drive on their original transmission. In 1898 auto maker Louis Renault used their basic design, but substituted a drive shaft for the drive chain and added a differential axle for the rear wheels to improve performance of the manual transmission. By the beginning of the 20th century most cars manufactured in the United States featured a non-synchronized manual transmission based on the Panhard/Levassor/Renault design. The next major innovation occurred in 1928 when Cadillac introduced the synchronized manual transmission, which significantly reduced gear grinding and made shifting smoother and easier. Manual transmissions were the standard on most vehicle for the first half of the 20th century, but automatic transmissions were being developed as far back as 1904. General Motors introduced the clutchless automatic transmission under the moniker, Hydra-Matic, in 1938, but the first true fully automatic transmission didn't appear until 1948 with the Buick Dynaflow transmission. Americans tend to prefer automatic transmission in their vehicles while Western Europe is--and is expected to remain--the largest market for manual transmissions through 2014. Eastern Europe and Asia are also large markets for manual transmission although Japan appears to be embracing more automatic transmissions. In the United States, more manual transmissions are found in the Northern states than in the Southern states. It is surmised that manual transmissions give better control on icy roads and are thus more useful in the North where the winters are more harsh. under the hood image by Lucy Cherniak from Fotolia.com Removing a manual transmission from your vehicle is not as difficult as it may seem at first and well worth doing the job yourself. In the beginning, all transmissions were manual. Now transmissions can be manual or automatic; regardless, their function is to take the power that the engine creates to move the car forward or backward. The transmission transfers the power via the drive shaft. The internal components of the transmission allow for different levels of torque to be applied, dependent upon on the speed the vehicle is traveling. This project will take approximately 90 minutes with the proper tools. Elevate the front of the vehicle using the floor jack and support the vehicle with two jack stands. Make sure the vehicle is stable. Disengage all electrical components connected to the transmission. Indicate by marking the position of the drive shaft for its reinstallation. From the output shaft, remove the rear U joint. Jam the cloth to keep the liquid from dripping out of the extension housing. Loosen the shift linkages and the speedometer cable from the transmission manually. Place the transmission jack under the transmission, and then take a socket wrench and remove the support nut, the cross-member, and the rear support insulator from the rear engine. Support the engine with a jack stand and use the transmission jack to withdraw the transmission toward the rear of the vehicle. Remove the transmission from the transmission jack. Image: Shutterstock Gear up for a great challenge with this transmission quiz!A transmission is literally the part of your car that makes it go vroom. A transmission is a series of gears that transfer power from one part of the car to another. Although transmissions can vary according to country, here in the US, a transmission refers to the gearbox (it encompasses the entire drivetrain in the UK). The point behind a transmission is to facilitate the changing of gears as the speed of the vehicle increases. With a manual transmission, the driver shifts gears... umm... manually, and with an automatic transmission, the gears are switched... you guessed it... automatically. Although the most familiar use for transmissions is in the automobile, transmissions may be found in other equipment and even wind turbines. Interestingly, only North America and Australia are the areas with the highest number of automatic transmissions, with most other countries counting vehicles with manual transmissions in higher numbers. In fact, many countries require individuals to learn and be tested on the operation of a vehicle with a manual transmission.But, you're a transmission aficionado, so you knew all that, right?Get ready to drive your way through this quiz. Glove up, put it in gear, and let's roll. TRIVIA Manual and Automatic Transmissions Quiz 6 Minute Quiz 6 Min TRIVIA True or False: Manual and Automatic Transmissions Edition 6 Minute Quiz 6 Min TRIVIA Can You Answer These Questions About Manual and Automatic Transmissions If We Give You a Hint? 6 Minute Quiz 6 Min TRIVIA Do You Know How to Drive a Manual? 7 Minute Quiz 7 Min PERSONALITY Can We Guess If You Drive a Manual or an Automatic Truck? 6 Minute Quiz 6 Min PERSONALITY Can We Guess If You're More Automatic or Manual Transmission? 5 Minute Quiz 5 Min TRIVIA Can You Match the TV Dad to His Car? 7 Minute Quiz 7 Min TRIVIA Could You Pass an American Driving School Exam? 7 Minute Quiz 7 Min TRIVIA How Well Do You Know the Canadian Rules of the Road? 6 Minute Quiz 6 Min PERSONALITY What Truck Are You Meant to Drive? 5 Minute Quiz 5 Min How much do you know about dinosaurs? What is an octane rating? And how do you use a proper noun? Lucky for you, HowStuffWorks Play is here to help. 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Automatic transmissions shift automatically through gears as needed, allowing the driver to focus on the road and their passengers. The differences in feel and mechanics run deep as we compare manual and automatic transmissions through this guide. Manual transmission 2017 Chevrolet Camaro ZL1 A manual transmission is also known as a stick-shift, and that says it all — the driver literally uses a stick to change gears. Your dad's first car might have had a steering column- or dashboard-mounted shifter, but in a modern car, the shift lever is almost always mounted vertically on the center console and connected to the transmission via a linkage. To change gears, a clutch disc sandwiched between the engine and the transmission needs to be released via a third pedal located on the left side of the brake. Release the clutch, select the desired gear, and engage the clutch again. From a standstill, engaging the clutch too slowly will wear out the disc prematurely, and engaging it too quickly will cause the engine to stall. Learning how to drive a stick shift takes a little bit of time, but it's rewarding and much simpler than it sounds. Driving a stick, you feel a connection to your car that is difficult to reproduce with an automatic transmission. Additionally, motorists who can operate a manual transmission are able to drive virtually any type of automobile, anywhere in the world — including in countries where renting an automatic is easier said than done. Three-speed manual transmissions were common in the 1940s, the 1950s, and even the 1960s; the original Ford Mustang came standard with a three-speed. Engineering departments added gears as technology improved, and as cars got faster and the need for efficiency increased. The four-speed manual became the norm for decades, then five, and now six. However, some high-end sports cars — like the Porsche 911 — offer seven gears. Automatic transmission 2017 Audi R8 V10 Plus Believe it or not, a transmission that shifts gears on its own was once considered a luxury, and it was an expensive option on many models for a long time. Browse the local classifieds and you'll inevitably notice the automatic transmission has become as widespread as power windows and air conditioning. There are two basic types of automatic transmissions. A traditional automatic is connected to the engine via a hydraulic torque converter, and a dual-clutch automatic relies on — you guessed it; nice work — a pair of clutches. Both can change gears without any input from the driver. The process is done hydraulically or electronically by monitoring important parameters such as the position of the throttle pedal, the speed that the car is traveling at, and the engine's revolutions. In many automatic cars, the gears can be selected manually using either the shift lever or paddles mounted behind the steering wheel. Having only two pedals offers many advantages. It's almost impossible to stall the engine with this configuration, and an automatic car tends to be smoother and more comfortable to drive than a stick-shift, especially in stop-and-go traffic. An automatic typically requires less maintenance than a manual as well, though that can vary from model to model. Finally, a dual-clutch automatic gearbox often shifts gears in mere milliseconds for greater performance and efficiency. Four-speed automatic transmissions were the norm in the industry for a long time, and a small handful of models still soldier on with just four gears. However, six- seven-, and eight-speed automatics are common today. Honda builds a nine-speed; Ford and General Motors even have a jointly developed 10-speed transmission on the market. More gears mean better acceleration, quieter highway driving, and improved fuel economy. CVT 2017 Honda CR-V The third main type of transmission is the continuously variable transmission, a name usually abbreviated to CVT. In lieu of gears, a CVT relies on a belt and pulley system that provides an infinite number of ratios. In other words, the transmission never shifts. CVTs are also found in scooters, motorcycles, and snowmobiles. Generally speaking, a car equipped with a CVT is smoother to drive than an equivalent model fitted with a regular automatic transmission. A CVT can improve gas mileage, too, which explains why a lot of hybrid cars are equipped with one. It's not all pros, though. Some buyers find driving a car with a CVT downright bizarre because it doesn't shift. The engine tends to drone when it's bolted to a CVT and cars often deliver rubber band-like acceleration. In a bid to boost consumer acceptance, car companies sometimes offer CVT-equipped cars with shift paddles that select preprogrammed ratios to mimic the gears in a regular automatic. Not every motorist will appreciate living with a CVT. Our advice is to try before you buy, and make sure you use it in many different scenarios, not just around the block. You may not notice what it's doing behind the scenes to keep you move it, or you may completely hate it. CVTs are in countless cars on the Japanese market, and they're becoming increasingly common in the United States. The Subaru Crosstrek, the Mitsubishi Outlander Sport, and the Honda CR-V are among the models that come with a CVT. Additionally, some performance cars — notably the Subaru WRX — offer a CVT instead of a standard automatic. Which transmission is right for me? You've probably heard that it's wise to choose your car based on its transmission. We agree. You can significantly narrow your options by deciding if you want a manual or automatic transmission. If not, you'll waste a lot of time sifting through countless options. Deciding on either a manual or automatic transmission comes down to two key factors: your specific driving style and what vehicle piques your interest the most. If you don't care about "driving dynamics," then you'll probably be just fine with the set-it-and-forget-it peace of mind accompanied by an automatic or CVT. Most car fans chose a manual transmission because they love to play an active role in driving. Remember that it's best to avoid a manual transmission if you have a long, traffic-heavy commute. A stop-and-go route is not fun if you have a manual transmission. However, it's important to note that you may have limited options because many newer vehicles only have one type of transmission available. In some cases, you can ask for a transmission change from the manufacturer, but that will cost a pretty penny. Folks who enjoy driving with manual transmissions will be saddened by their lack of longevity in the car industry. Many U.S. automakers are decreasing the number of manual transmissions they produce, making manual transmission a luxury for active drivers. Thankfully, there are still a few affordable cars on the market that offer a manual transmission. These include the Volkswagen GTI, the Subaru Impreza, the Mazda MX-5 Miata/Fiat 124 Spider siblings, and the Toyota 86. There are also options available to those with bigger budgets, including the BMW M3, the Porsche 911, and the Jaguar F-Type, although you may have to special-order one. Editors' Recommendations

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