DOWNLOAD PDF C. REDUCTION AND REVERSE GEARS

Chapter 1 : Reverse reduction and clutchable reduction gearboxes | van Stigt, Aandrijf Specialist

Reduction gears are classified by the number of steps used to bring about the speed reduction and the arrangement of the gearing. A gear mechanism consisting of a pair of gears or a small gear (pinion) driven by the engine shaft, which directly drives a large (bull) gear on the propeller shaft, is called a single-reduction gear.

In some automatic transmissions the rear band has been replaced by a holding clutch. Key Terms and Definitions Band: A device used to hold a part of the gear train assembly from turning in order to achieve a particular gear ratio. A device used to lock two 2 components together in order to transmit motion. Primarily used for engaging the input shaft to the gear assembly. To engage the teeth of one gear with those of another. A clutch mechanism that will drive in one direction only. If driving torque is removed or reversed the clutch slips. Also referred to as a one way clutch. The gears in a planetary gear set that are in mesh with both the ring gear and the sun gear. Referred to as planet gears in that they orbit or move around the central or sun gear. A gear unit consisting of a ring gear with internal teeth, a sun or central gear with external teeth, and a series of planet gears that are meshed with both the ring gear and the sun gear. A gear with internal teeth. The outer gear in a planetary gear set. A compound planetary gear set where the sun gear is common between both sets of planetary gears. A joint between two parts in which each part has a series of cuts or grooves along the contact area. When connected the splines from one part fit into the grooves of the other and vise versa. The central gear around which the planet gears revolve. Rules of Planetary Gears To determine the gear condition in a simple planetary gear set always look at what the carrier is doing. If ever the carrier is an output in a simple planetary gear set, the condition will be forward reduction. If ever the carrier is held in a simple planetary gear set, the condition will be reverse. If ever the carrier is an input in a simple planetary gear set, the condition will be overdrive. Safety When working on a transmission, there are many hazards to be aware of in order to avoid personal injury. The following safety rules should be observed when working on any transmission. Sharp edges and unfinished casting pieces could cut you severally. Never run your hands freely across any surfaces without some form of protection work gloves or a rag. Oil is a carcinogenic and should not be left on your skin. Be sure to wipe off any excess oil from your hands when you have finished your work for the day. If a transmission has any burned oil on its surfaces and is giving off excessive odour, be sure to keep the work area well ventilated. Some transmission parts are extremely heavy and could cause harm if they are dropped. Always handle all transmissions parts with care. Never attempt to lift any transmission parts that exceed your own capabilities. Most internal transmission parts have very low tolerances and should not be forced into place on the transmission. Follow all recommended procedures when every dismantling or assembling any transmission. Be sure to have another person support the transmission, when applying excessive force tightening or loosening a fastener to prevent the transmission from toppling over and causing any bodily harm or damage.

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Chapter 2 : Transmission Weight Reduction - Tech, How To - Hot Rod Network

Generally speaking the reduction gear is of the proven single-input single-output design with built-in clutch and thrust block. They have a variety of power take-o s that enable large shaft generators to be driven, and electric motors to feed in p.

The intermediate gear provides spacing but does not affect the gear ratio. For this reason it is called an idler gear. The same gear ratio is obtained for a sequence of idler gears and hence an idler gear is used to provide the same direction to rotate the driver and driven gear. If the driver gear moves in the clockwise direction, then the driven gear also moves in the clockwise direction with the help of the idler gear. The somewhat larger gear in the middle is called an idler gear. It is not connected directly to either the motor or the output shaft and only transmits power between the input and output gears. There is a third gear in the upper-right corner of the photo. The input gear in this gear train has 13 teeth and the idler gear has 21 teeth. Considering only these gears, the gear ratio between the idler and the input gear can be calculated as if the idler gear was the output gear. At this ratio, it means the drive gear must make 1. Essentially, the larger gear turns slower. The third gear in the picture has 42 teeth. The idler gear serves to make both the drive gear and the driven gear rotate in the same direction, but confers no mechanical advantage. Belt drives[edit] Belts can have teeth in them also and be coupled to gear-like pulleys. Special gears called sprockets can be coupled together with chains, as on bicycles and some motorcycles. Again, exact accounting of teeth and revolutions can be applied with these machines. Valve timing gears on a Ford Taunus V4 engine â€" the small gear is on the crankshaft , the larger gear is on the camshaft. The crankshaft gear has 34 teeth, the camshaft gear has 68 teeth and runs at half the crankshaft RPM. The small gear in the lower left is on the balance shaft. For example, a belt with teeth, called the timing belt , is used in some internal combustion engines to synchronize the movement of the camshaft with that of the crankshaft , so that the valves open and close at the top of each cylinder at exactly the right time relative to the movement of each piston. A chain, called a timing chain, is used on some automobiles for this purpose, while in others, the camshaft and crankshaft are coupled directly together through meshed gears. Regardless of which form of drive is employed, the crankshaft-to-camshaft gear ratio is always 2: Automotive applications[edit] Illustration of gears of an automotive transmission Automobile drivetrains generally have two or more major areas where gearing is used. Gearing is employed in the transmission , which contains a number of different sets of gears that can be changed to allow a wide range of vehicle speeds, and also in the differential , which contains the final drive to provide further speed reduction at the wheels. In addition, the differential contains further gearing that splits torque equally between the two wheels while permitting them to have different speeds when travelling in a curved path. The transmission and final drive might be separate and connected by a driveshaft , or they might be combined into one unit called a transaxle. Example[edit] A Chevrolet Corvette C5 Z06 with a six-speed manual transmission has the following gear ratios in the transmission:

Chapter 3 : Reduction Gears

In some small installations, the clutch, the reverse gear and the reduction gear may be combined in a single unit. In other installations, the clutch and the reverse gear may be in one housing and the reduction gear in a separate housing attached to the reverse-gear housing.

On synchromesh boxes, friction cones or "synchro-rings" are used in addition to the dog clutch to closely match the rotational speeds of the two sides of the declutched transmission before making a full mechanical engagement. The former type was standard in many vintage cars alongside e. The latter is the modern standard for on- and off-road transport manual and semi-automatic transmission, although it may be found in many forms; e. Manual transmissions are the most common type outside North America and Australia. They are cheaper, lighter, usually give better performance, but the newest automatic transmissions and CVTs give better fuel economy. In Malaysia and Denmark all cars used for testing and because of that, virtually all those used for instruction as well have a manual transmission. Manual transmissions can include both synchronized and unsynchronized gearing. For example, reverse gear is usually unsynchronised, as the driver is only expected to engage it when the vehicle is at a standstill. Many older up to s cars also lacked synchronisation on first gear for various reasonsâ€”cost, typically "shorter" overall gearing, engines typically having more low-end torque, the extreme wear on a frequently used first gear synchroniser Some manual transmissions have an extremely low ratio for first gear, called a creeper gear or granny gear. Such gears are usually not synchronized. This feature is common on pick-up trucks tailored to trailer-towing, farming, or construction-site work. During normal on-road use, the truck is usually driven without using the creeper gear at all, and second gear is used from a standing start. Non-synchronous transmission Some commercial applications use non-synchronized manual transmissions that require a skilled operator. This class may include commercial , military, agricultural , or engineering vehicles. Some of these may use combinations of types for multi-purpose functions. An example is a power take-off PTO gear. The non-synchronous transmission type requires an understanding of gear range, torque, engine power, and multi-functional clutch and shifter functions. Also see Double-clutching , and Clutch-brake sections of the main article. Float shifting is the process of shifting gears without using the clutch. Automatic transmission Epicyclic gearing or planetary gearing as used in an automatic transmission. Most modern North American, and some European and Japanese cars have an automatic transmission that selects an appropriate gear ratio without any operator intervention. They primarily use hydraulics to select gears, depending on pressure exerted by fluid within the transmission assembly. Rather than using a clutch to engage the transmission, a fluid flywheel, or torque converter is placed in between the engine and transmission. It is possible for the driver to control the number of gears in use or select reverse, though precise control of which gear is in use may or may not be possible. Automatic transmissions are easy to use. However, in the past, some automatic transmissions of this type have had a number of problems; they were complex and expensive, sometimes had reliability problems which sometimes caused more expenses in repair , have often been less fuel-efficient than their manual counterparts due to "slippage" in the torque converter , and their shift time was slower than a manual making them uncompetitive for racing. With the advancement of modern automatic transmissions this has changed. In older transmissions, both technologies could be intrusive, when conditions are such that they repeatedly cut in and out as speed and such load factors as grade or wind vary slightly. Current computerized transmissions possess complex programming that both maximizes fuel efficiency and eliminates intrusiveness. This is due mainly to electronic rather than mechanical advances, though improvements in CVT technology and the use of automatic clutches have also helped. A few cars, including the Subaru Impreza [11] and the model of the Honda Jazz sold in the UK, actually claim marginally better fuel consumption for the CVT version than the manual version. For certain applications, the slippage inherent in automatic transmissions can be advantageous. For instance, in drag racing , the automatic transmission allows the car to stop with the engine at a high rpm the "stall speed" to allow for a very quick launch when the brakes are released. In fact, a common modification is to increase the stall speed of the transmission. This is even more advantageous for turbocharged engines, where the turbocharger must be kept

spinning at high rpm by a large flow of exhaust to maintain the boost pressure and eliminate the turbo lag that occurs when the throttle suddenly opens on an idling engine. Semi-automatic transmission A hybrid form of transmission where an integrated control system handles manipulation of the clutch automatically, but the driver can stillâ€”and may be required toâ€”take manual control of gear selection. This is sometimes called a "clutchless manual", or "automated manual" transmission. Many of these transmissions allow the driver to fully delegate gear shifting choice to the control system, which then effectively acts as if it was a regular automatic transmission. They are generally designed using manual transmission "internals", and when used in passenger cars, have synchromesh operated helical constant mesh gear sets. Most modern implementations, however, are standard or slightly modified manual transmissions and very occasionally modified automaticsâ€”even including a few cases of CVTs with "fake" fixed gear ratios , with servo-controlled clutching and shifting under command of the central engine computer. These are intended as a combined replacement option both for more expensive and less efficient "normal" automatic systems, and for drivers who prefer manual shift but are no longer able to operate a clutch, and users are encouraged to leave the shift lever in fully automatic "drive" most of the time, only engaging manual-sequential mode for sporty driving or when otherwise strictly necessary. Specific types of this transmission include: A dual-clutch transmission alternately uses two sets of internals, each with its own clutch, so that a "gearchange" actually only consists of one clutch engaging as the other disengagesâ€”providing a supposedly "seamless" shift with no break in or jarring reuptake of power transmission. There are also sequential transmissions that use the rotation of a drum to switch gears, much like those of a typical fully manual motorcycle.

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Chapter 4 : Planetary Gears: Sun & Simpson Gears â€“ SchoolWorkHelper

Reversers Zero Drag Zero Drag Assembly Figure 1 Zero Drag Reverser Nothing turns in Forward, but the Shaft Bellhousing Mount planetary reduction in reverse.

The reduction gear Authored by: Martin Leduc, October Brought to you by www. Check out the many different setups which have evolve to achieve this, by visiting this page. Learn about the prime movers - steam , diesel engine , gas turbines. We start at the flywheel, and work our way back to the propeller. Check out the previous page on clutches. Introduction The propeller is match to the vessel, what is it going to take to overcome the resistance of the vessels in the water due to its design. The engine is then matched to the propeller. What power requirements are needed to turn that propeller? At this stage, reduction gears come into play. The reduction gear allows the naval architect to have the most efficient propeller operation while having options on the prime mover. Diesel engines usually have three general speed in which they are classified in. The slow speeds diesel, rpm, rarely need gears as they are already suited for optimum propeller speed. By slowing down the propeller we minimizes slippage waste which makes the whole power plant more efficient. Reduction gears are rather simple, one small gear, driven by the engine, driving a large gear which is connected to the propeller shaft. The ratio of teeth between the smaller and larger gears is the ratio of reduction. One revolution of the big gear means that the small gear has turned four times which gives us a 4: The larger reduction gears are usually as simple as two gears, with one input and one output. With the increase use of controllable pitch propellers, which allows the prime mover to rotate at a given and steady speed, some features have been added to the larger marine reduction gears. Taking advantage of the power already being developed by the main engine. This allows the whole operation of the ship to be more efficient and perhaps have less equipment to accomplish the same work as before. Hydraulics system on large fishing boats are a good example, also shaft generators are another. On smaller reduction gears, like those found on tugs, yachts, fishing vessels, etc. For example many small gears will feature a built in clutch, they also have reverse and the thrust bearing is built into the gear. In contrast, a coastal freighter may have an independent clutch, reduction gear, thrust bearing, and obtain reverse by using a controllable pitch system. Gears are generally helical cut gears. Gears are usually trouble free in their operations as long as their lubricating oil is sufficient, cool and appropriately suited for the function of the gear. Deterioration of the oil cooler - heat exchanger - can also be a source of oil contamination. These problems can be mitigated by scheduled preventive maintenance such as daily checks and oil sampling. Surveys are generally carried out every four years depending on Classification society.

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Chapter 5 : Clutches, reverse gears, and recuction gears

GEAR OPERATION AND PARTS FOR REDUCTION GEAR MODEL AND SERIAL NUMBERS bottom of the reverse gear housing and the reduction gear housing.

Contact Reverse reduction and clutchable reduction gearboxes Our reverse reduction and clutchable gearbox programme is very wide in a power range from10 to kW with 0. For commercial applications we have either cast-iron or welded steel casings with vertical or coaxial offset, that can be used for propulsion, pump drive or otherwise. Clutchable or non-clutchable and two speeds are among the possibilities. Apart from this, we have various rebuild units. Service Our workshop in Gorinchem is especially equipped for the maintenance of reverse reduction and clutchable reduction gearboxes. ZF-Marine ZF Marine reverse reduction and clutchable reduction gearboxes are the cream of the crop regards to weight and compact building. Advantages of ZF The casing is ultra-light due to using both a special aluminium alloy â€" developed by ZF â€" and a sophisticated design. Also in the field of gear design ZF excels, so that a great power density is reached at a low noise level. Typical ZF applications The ZF Marine light-weight designs are mostly used in fast-sailing ships, from luxury yachts to patrol boats and from catamaran working ships to ferries. Where weight plays less of a part, it is also possible to choose a cast-iron casing. Our company is highly knowledgeable as to ZF as far as selling and servicing is concerned. Apart from this, we keep a large stock of ZF transmissions as well as spare parts. Production according to ISO Among other things, Masson makes reverse reduction and clutchable gearboxes in the capacity range of to 3, kW. Masson is an expert in PTOs with 1 to 5 shafts, live as well as clutchable. The Masson gearboxes are very suitable for hybrid propulsions. Based on present technologies and small adaptations, the Masson is widely used within the hybrid market. Reverse reduction and clutchable gearboxes with their shafts in line coaxial , high transmission ratios up to Masson supplies a true working-ship gearbox for inland shipping, towing , fisheries, coastal navigation, yet also very suitable for sand-pump and jet-pump drives. In the fields of sales and servicing, our firm has an extensive knowledge of Masson. Apart from that, we keep a large stock of both complete products and spare parts.

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Chapter 6 : 4 Easy Ways to Determine Gear Ratio (with Pictures)

Reverse reduction and clutchable reduction gearboxes Our reverse reduction and clutchable gearbox programme is very wide in a power range from10 to kW with to reductions. Robust aluminium casings for fast ships and luxury yachts with a vertical/horizontal offset, down-angle or V-drive.

This severely limits the number of options available to the competitive racer. There are the normal junkyard options, Muncie and Saginaw, but those are getting extremely difficult to find. One popular solution is the T10 transmission, now being produced by Richmond Gear. The right to produce the transmission is now owned by Richmond Gear, which mainly sells it to racers and street rodders. The T10 is also a four-speed, which is one more than most oval-trackers need for racing. Johnny Hightower, owner of Hightower Racing Transmissions, has been building custom racing transmissions for years. Recently, Hightower turned his attention to transforming the T10 into an oval-track monster. That leaves the Richmond T10 unit, which is the only thing that is strong enough to be raced, still being built new and will fit within the rules. Now Hightower has made the playing field a little more level with his three-speed version of the T Originally, he began with a completely stock unit and made all modifications himself. Now though, he has been able to work with Richmond to produce custom pieces exclusively for his use. The first step is to cut down the cluster gear. To minimize heat buildup Hightower actually cuts the gears off the cluster on a lathe instead of grinding the metal away. It requires more time and a lot more care with specialized tooling, but he believes the end result is worth it. To match the new cluster gear configuration, Hightower also uses custom output shafts. We did a very unscientific test comparing the roller-bearing equipped shaft with the standard unit. Without lubricant or any tension on either gear, a flick of the wrist sent the roller-bearing gear spinning two to three times longer than the gear spinning directly on the shaft. The motion is quite noticeably smoother. Neither is good for a transmission. The bearings help reduce all of that. The transmission depends on oil splashing up between the gear and the shaft to provide proper lubriction; a roller bearing just requires less lubricant. Hightower uses REM equipment and a special media mixture designed to reach even the tightest slots on the gears. Assembly is fairly straightforward. Hightower has significantly cut down the reverse gear. It can be used to back the car, but only very gently. For simply maneuvering the car around the pits, he recommends pushing the car whenever possible. Reverse gear is weak in almost every full-race transmission. Overall, when Hightower has finished remaking a T10, the reverse gear is gone from the tailhousing, the idler gear is cut down, first gear now reverse is significantly cut down and the synchronizers and shifter fork are removed. And if the customer wants it, the tailhousing bushing is also replaced with a roller bearing to further reduce parasitic losses. It all adds up to approximately seven pounds of rotating weight removed from the transmission. Second is used for a pit gear, third is the gear for restarts and fourth, of course, is for racing.

Chapter 7 : Part two: The reduction gear

Gears and Gear Ratios â€¢ To reverse the direction of rotation â€¢ To increase or decrease the speed of rotation work on gears Band C.

Chapter 8 : Reverse gearbox project. - RC Groups

Technician A says that one planetary gear set can provide gear reduction, overdrive, and reverse. Technician B says that most transmissions today use compound (multiple) planetary gear sets.

Chapter 9 : Gear train - Wikipedia

A gear train is a mechanical system formed by mounting gears on a frame so the teeth of the gears engage.. Gear teeth are designed to ensure the pitch circles of engaging gears roll on each other without slipping, providing a smooth

transmission of rotation from one gear to the next.