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******* CLUTCHES *******

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CLUTCH TYPE: The flathead V8 came with a clutch originally designed and manufactured by Borg-Warner (B-W) Mfg. The centrifugal weight idea as well as the design was patented by B-W and is known as a "Long" type clutch. Rather than depend solely on spring tension to reduce slippage (like a diaphragm clutch did and still does), they use centrifugal weights to increase tension as rpm increases (the faster the clutch pressure plate spins the higher the engagement tension). Ford used this type clutch into the fifties when they changed to a "diaphragm" clutch to decrease clutch pedal pressure. It's often been referred to as a "soft" or "velvet touch" clutch.

The infamous Auburn clutch. Early day flathead racers swore by the Auburn clutch as the ultimate clutch for racing. These were a very light diaphragm clutch which made shifting at high rpms a breeze. The lightness of these clutches was like lightening the flywheel and helped increase acceleration. Using a Ford "Long" type clutch often prevented shifting at high rpm (the centrifugal weights increased tension so much the clutch wouldn't disengage which left the hapless racer stuck in the lower gear until the rpms dropped). Many flatheaders on a budget simply removed the weights off their Long type clutches with a torch or grinder and went racing! This often resulted in slippage.

LONG TYPE CLUTCH ENGAGEMENT PRESSURES: **At rest, a stock 9" pressure plate exerts 810 psi. A 10" exerts 1005 psi. An 11" exerts 1215 psi. ~~From rodnut: These were stock Ford/Merc applications.... Ford made special heavy duty clutches for special use..... taxis, police cars, trucks, etc.~~**

SIZES: Ford used 9" ('35 to '40), 10" ('41 to '48 passenger car), and 11" ('41 to '48 trucks) clutches. As the diameter increases, so does the weight. Increasing clutch weight is the same as changing to a heavier flywheel. The 9" was used into the forties. Then the 10" was introduced and was around to the end of flathead production. The 11" was called a truck clutch, but they did show up in passenger cars from the factory. Guess Henry had a surplus? Using an 11" clutch in early flatheads necessitates removing the crankcase pan to replace it because the opening in the bell housing is too small to permit extracting and/or installing the larger clutch cover and disc. Many truck pans had a removable lower pan section for just this purpose.

Story: Many think a 9" clutch will not tolerate heavy duty use. I ran a 9" in my '48 convertible while in the Navy. The clutch was completely stock except for the pressure plate springs (from a 10"). The 239 inch engine had stock bore and stroke with milled heads, dual Stromberg carbs, a mild cam, and a VERY light steel flywheel. I ran the car at drags several times and street raced it a lot. I flat-towed a full fendered '46 Ford stock car 80 miles to the track each week during the race season for 3 years. It also towed a 26 foot house trailer from the Utah-Colorado border to south of Corpus Christi, Texas.... and back....

using the same 9" clutch with no problem! I think this pretty much proved to me a 9" clutch will take punishment.

******* PRESSURE PLATES / CLUTCH COVERS *******

GENERAL DESCRIPTION: The long type clutch cover (also called a pressure plate), has 3 release levers that are operated by the throw-out bearing. These 3 levers MUST all be in the same plane (equal height) when the cover and disc are torqued to the flywheel. If they are not in the same plane, the clutch cover will not operate correctly. It'll usually chatter and/or function erratically. The height of the fingers can be adjusted by using a FLAT piece of steel plate (or other non-compressible material) in place of the clutch disc for adjusting purposes. A clutch disc is too soft to use. ~~(From rodnut on 1/30/03....The thickness varies with the diameter of the clutch....A 9" plate is 0.350"....A 10" plate is 0.295"....An 11" plate is 0.356"....)~~ Torque the plate and pressure plate to the flywheel. Measure and adjust the throw-out bearing engagement bolts on the 3 release levers. ~~(From rodnut on 1/30/03....Height varies according to the size of the clutch....Fingers on a 9" are set 11/16" from the top of the cover to the high point on the adjusting screw....On a 10" they're set 15/16"....On an 11" they're set 7/8"....)~~ If they're not the EXACT same height, adjust the bolts on the release levers (tolerance is 0.010"). These are a real bi*** to adjust since they're split and spread apart. I do NOT recommend welding and grinding these bolts. All clutch covers from the rebuilder or new parts manufacturer should come adjusted correctly, but it's a good idea to double-check all of the finger heights. Especially if you've been plagued with clutch chatter or have a strong running mill which will be raced.

INCREASING CLUTCH ENGAGEMENT PRESSURE: Changing the springs in the clutch cover to stronger springs will result in increased engagement tension with a resultant decrease in slippage. Although installing a larger clutch will produce the same result along with the added benefit of more friction material, the larger clutch will also increase the mass of the flywheel/clutch assembly considerably (didn't you just go to a lot of trouble and expense to reduce your flywheel weight?). This is the same as adding weight to the flywheel which will decrease acceleration. Clutch rebuilders stock different strength springs and will replace stock springs with stouter ones during rebuild.... just ask. However, this can be done at home with the help of friends, a long pry bar, and using basic hot-rodder ingenuity. It's a fairly simple process, but BE CAREFUL.... those springs do fly around at about Mach 7 or so..... and have been known to take out windows while in flight!

Or you could just take it to a rebuilder and have him change springs for some minor compensation. Well worth the expense, and you won't have to organize a search party to locate the springs and nuts that flew (including out the window and into the vacant lot next door). Don't forget the engagement effort (pushing down the clutch pedal) increases dramatically and stock linkage (as well as your clutch leg) may need beefing up (I beefed up my linkage after it bent... I never learn easily!). Don't forget to check the height of the three fingers anytime you've been messing with the springs etc.

***** **CLUTCH DISCS** *****

GENERAL DESCRIPTION: Discs use different types of lining materials depending on their intended application. The ones in our flatheads used to use asbestos. Now they use materials which are asbestos free due to health dangers (big brother watching over us?). Too bad because the asbestos provided superior cushioning, smoother engagement, and better wear than the materials we now get. The linings contain metal particles to aid heat dissipation and to increase disc life. The linings have grooves in their faces for air ventilation and to help disperse lining dust. The dust causes chatter and slippage due to it's slip/grab action. The 6 to 9 springs around the disc hub may vary from loose to tight. This does not affect the operation of the disc. Don't be concerned if they rattle when the disc is shaken (not stirred like James Bond prefers). They're there to help absorb shock and engine pulsations.

REBUILT CLUTCHES: When rebuilders are rebuilding clutches, they normally dismantle a bunch of similar type clutches and dump them into their cleaner and sand blaster piles. During assembly they're not particular and use the next part in the pile. Consequently, parts are mismatched, which can, and usually does, result in dreaded clutch chatter.

[Story: On a '75 Trans AM with a 400 inch V8, I replaced SIX rebuilt clutches in 5 days to eliminate a severe clutch chatter. The original clutch did not chatter but got tore off the clutch disc facing in a contest with a 'vette (my daughter didn't win that match but did win the re-match with the new clutch in it). Each clutch was was rebuilt by a different rebuilder. Each chattered so badly I could barely back up (the wheels would actually leave the ground)! Naturally, each rebuilder said it was something I'd done wrong or the car had excessively worn parts (on a 15,000 mile car?). Funny isn't it how it's never their product that's at fault isn't it? One disc was put in and wouldn't even move the car. After I removed it, I discovered the rivets holding the disc hub were sheared in half.... the heads of the rivets were intact and the round sections between the heads were sheared..... consequently the hub just spun! And no they wouldn't pay labor to replace it! Finally went to a NEW disc and NEW pressure plate. Smooth as glass! Understand I was absorbing all labor as well as chasing after parts for each replacement which sure didn't make me a happy camper!]

After this adventure, I use new clutch covers and discs whenever possible. With the passage of time, new ones are becoming harder and harder to find for flatheads. The only recourse is to rebuild worn-out parts. I take the cover and disc to the guy that rebuilds them for me and ask him to tag all the parts and keep them separate for reassembly. He's always happy to do this. That way I know how much chatter a particular pressure plate and disc had to begin with and after it's rebuilt it sure shouldn't be any worse.

***** **PILOT BEARINGS** *****

PILOT BEARINGS: These provide needed support for the front of the transmission's main drive gear. It primarily operates only during engagement and dis-engagement of the clutch. When the pilot bearing becomes worn, it permits the main drive gear to jump up and down in the flywheel, the throwout bearing, and the clutch disc. Not a good thing. This is certain to promote clutch chatter and erratic clutch operation. (Ever wonder what the thrust bearing on

the engine crankshaft is subjected to during clutch chatter? Scary!) There are two types of pilots used in the flathead.... bushing and bearing.

Bushing type: These are usually made from "Oilite" (a trade name for porous bronze that is impregnated with oil) and are simply called bronze bushings. Oilite wears fairly fast due to it's softness and porosity. Ford specifies a maximum wear of 0.006". It's not uncommon to find some worn as much as 0.080"-0.100"! Many have been beat on so long they've become egg shaped. When installing a bronze bushing, lube it with a very thin film of high-temp grease on the inside of it's bore. Rule of thumb I use is to replace the bushing whenever I am looking at one.

Bearing type: These replace the bronze bushings. Because bearings are made of quality hardened steel they last a long time. Most are a sealed type bearing and come with a little cheap low-temp grease. Generally this thin grease is slung out in to the clutch area the first time it's used. A cure I use is to remove the soft neoprene type seal on one side of the bearing using a sharp pick tool. I'm careful to not damage the seal since I'll re-use it. Clean the bearing with solvent and dry it with air and/or heat. I don't spin it with air since it'll quickly ruin the bearings and races due to heat generation. I work some (don't pack it since it'll just sling it off) high-temp thick grease into the bearing (I use Lubriplate #70 which is intended for wheel bearings, but it's no longer available.). Reinstall the seal and install the bearing. I do this to every new pilot bearing I put in (OHV and FH). Most bearings treated this way last nearly 100,000 miles. Otherwise the cheap grease they come with is gone quickly and the bearing is soon galled and junk. I prefer bearings over bushings since I'm lazy and don't want to work on things much anymore.

***** **THROW-OUT BEARINGS** *****

THROW-OUT BEARING LUBRICATION: These used to come packed with a relatively heavy high-temp quality grease. Then manufacturers went to a cheap thin grease and not much of it. Consequently, bearings no longer last. The cheap grease thins from the high temperatures generated in the clutch area and is soon slung out of the throw-out bearing. This not only causes the bearing to run relatively dry, it can also cause grease to get on the clutch and flywheel engagement surfaces which promotes clutch chatter and erratic engagement. One of the added benefits(?) is you get to listen to the throw-out bearing let out a blood curdling howl on cold days and in front of your buddies. Neat! While rotating the bearing slowly you can feel any bearing roughness. New throw-out bearings are lucky to last 15,000 to 20,000 miles before they start their howling act.

~~(From rodnut: There are two or three different grades of throwout bearings.)~~

A cure I use is to grease them myself ... new and used! These can be greased without much effort. I wash the new or used bearing in solvent until I'm certain all of the cheap grease used by the manufacturer is gone. Dry it without spinning it (low heat or compressed air). Drill a single 1/8" hole on the outer edge of the bearing (not in the engagement surface nor in the outer bearing race). This is pretty hard and a good bit is needed. Then I use a needle type U-joint grease zerk adapter and give it TWO shots of high temp grease. Rotate the bearing half way around and give it TWO more shots of grease. That's all the grease it'll need for well past 50,000 miles. Rotate the bearing several times to disperse the grease. I plug the 1/8" hole with a tiny sheet metal screw and some red Loctite or solder it shut. Either works. In my Rancho, I've got over 200,000 miles on the same throw-out bearing using this method... and this is after it first howled.

***** **CLUTCH CHATTER** *****

CLUTCH MARCELS: This seems to be the biggest problem we have with flathead Long type clutches. By far the most critical element of the disc in eliminating chatter is called the "marcel". This is the term given to the crimped plate, or wafer, that separates the two disc friction linings. The marcel provides the clutch disc with some "give" during clutch engagement. It also helps prevent the disc lining from sticking to the flywheel and/or pressure plate during clutch disengagement. The thickness of the marcel (the distance the marcel keeps the linings separated) will vary depending on the type of use the clutch disc was designed for. Basically the thicker the marcel, the smoother the clutch will be. It'll also feel softer to your foot. One drawback of a thicker marcel is the increased pedal travel needed to engage and disengage the clutch. Absence of marcel makes the clutch grab and gives a very positive lock up (less slippage with an increased ability to withstand more horsepower).

Marcel thicknesses for different applications:

Drag racing and heavy duty truck clutches usually have 0.000" to 0.010" marcel since engagement needs to be quick and abrupt and chatter is of no concern.

Street/strip clutches usually have 0.015" to 0.020" marcel.

Pure street clutches will use marcel in the 0.025" range.

A super soft clutch often times have marcel in excess of 0.030" to 0.040" thick.

Many newer disc manufacturers are experimenting with new and different materials which are fairly hard and/or stiff. These have a lot less cushion than the old asbestos discs and the manufacturers have increased the marcel thickness to compensate for this. Some stock replacement discs have marcel 0.050" to 0.060" thick! One thing of interest is the use of marcel requires the linings be riveted. If no marcel is used, the linings can be bonded.

PILOT BUSHINGS AND CLUTCH CHATTER: These contribute greatly to clutch chatter. Replacing bushings with bearings seem to help. Also remove all traces of paint, rust, etc. on the mounting faces of the transmission (or bell housing) to engine to prevent misalignment.

TEMP CLUTCH CHATTER FIXES: Understand, the following do not take the place of correcting the problem... and are merely temporary fixes.

Early transmissions: Squirting some powdered graphite on the clutch disc linings will often reduce chatter. Remove the inspection cover on the top of the earlier transmissions. Depress the clutch pedal to the floor and hold it down with a 2X4 wedged against the seat. Squirt some spray powder graphite (like used in cylinder locks) between the clutch disc linings and their two engagement surfaces on the flywheel and pressure plate. Takes about two squeezes. Repeat this every 90 degrees around the clutch. This would seem like it'd slip bad, but it doesn't. Many times it'll completely eliminate clutch chatter. However, if you really go overboard with the graphite, it will slip. This is an old trick I learned while working in a used car lot.

On 8BA transmissions: Loosen the 4 transmission to bell housing bolts several turns. Pry the transmission towards the rear and hold it back with a screwdriver driven between the trans and bell housing. Slip one shim 0.020" to 0.030", or a piece of a cruise dash plaque (they're 0.030" thick), in between the transmission case and the bellhousing on the lower right corner only. Remove the screwdriver

and tighten the trans bolts back up. This will cock the transmission main drive gear in the pilot bearing and will often reduce some clutch chatter for a time. Another used car lot trick.

ENGINE STAY-RODS: These were used up through the '48 engines. They certainly help control clutch chatter. Run 'em if you've got 'em.

CLUTCH CHATTER ELIMINATORS: These came out in the forties and were after market items. They really work on '33 thru '48 cars with their center X frame. And are simple to construct and install. The design uses a "V", a long bolt threaded on both ends, 4 old pin type shock absorber bushings with washers, two nuts for the long bolt, and a stout "S" shaped hook. I didn't include dimensions since you can determine them for your particular car. The following should help you with your design. **Pictures are currently** shown on the Flathead Techno Site.

The front pieces to form the "V" are made from a two lengths of 3/8" X 1" flat stock. The two pieces have to be long enough to reach from the lower two trans bolts to about the middle of the trans. You'll need heat to bend things unless your fingernails are rough from dragging on the asphalt as you walk! Bend both ends of each of the two pieces 90 degrees and drill holes in both bends. The two at the trans should be 3/8" diameter for the trans bolts to go through. Both rear holes need to be the same diameter as the long rod. Attach the two pieces to the lower two bolts of the trans without using bushings. Bend the 2 pieces so the remaining two ends have their 90 degree bends overlap and their holes line up.

The long rod with both ends threaded back a good inch or so has to be long enough to go from the intersection of the two pieces you just installed to the trans and extend to near the front of the X center cross member (6" or so). Put a bushing and washer on each side of the rod that goes through both pieces from the trans and hold these together with a nut. The other end of the rod will get bushings and washers on each side of the "S" shaped hook.

Use a piece of 3/8" flat stock and bend in an elongated "S". Hook one end in the rear of the center X frame member. The S goes from the rear of the X member towards the front of the car. Drill a hole in the other end of the S for the long rod to go through. Install the rod through the hole in the S hook.

Hook everything up and tighten the nuts quite a bit on each end of the long rod. This will virtually eliminate nearly all, if not all, clutch chatter. If you have problem understanding this after going over it while under your car, please e-mail me and I'll see if I can help.

***** **LIGHT FLYWHEELS** *****

LIGHT FLYWHEELS: The "lip" type flywheel used a 9" clutch and weighs 38.7 lbs. They came in all of the early V8's. They are my preferred flywheel because they use the lightest clutch (bet you've already figured out I'm some kind of nut about light rotating mass). Beginning in '35, the pickups and sedan deliveries all used a flywheel without a lip, but still used a 9" clutch. These weigh 34 lbs. They were much sought after for stock cars where rules stipulated flywheels had to be stock. Most other early flywheels, other than the lip type 9", weigh 36 lbs. The 8BA and 8CM flywheels weigh 34 lbs.

Lightening a lip-type flywheel: Machining the flywheel's lip off, chamfering outward from the edge of the pressure plate to the starter ring gear, dishing out the rear of the flywheel to reduce the flywheel thickness, will reduce the 38 lb.

weight of a lip type flywheel to about 20 lbs. Combined with the lighter 9" clutch, they are my preferred combination for a street flathead.

On street machines, flywheel weight is best left at 20 lbs. (A light high boy roadster with a built-up flathead and low gearing would certainly be an exception.) If the flywheel is too light, it's difficult to launch a heavy car at stop lights without revving the engine considerably. Aluminum flywheels with no steel or brass facing wear quickly and don't take kindly to clutches being slipped. I don't use an all-aluminum flywheel (no steel or brass facing) on the street. A steel or brass faced one is less than the 20 lb weight rule I use.

In the early days we all heard and believed the following: "During acceleration every pound of flywheel weight is the same as adding 100 pounds of weight to the car." Seems to me this would apply to all reciprocating masses like the crankshaft, clutch and flywheel.

[Return to Home Index](#)