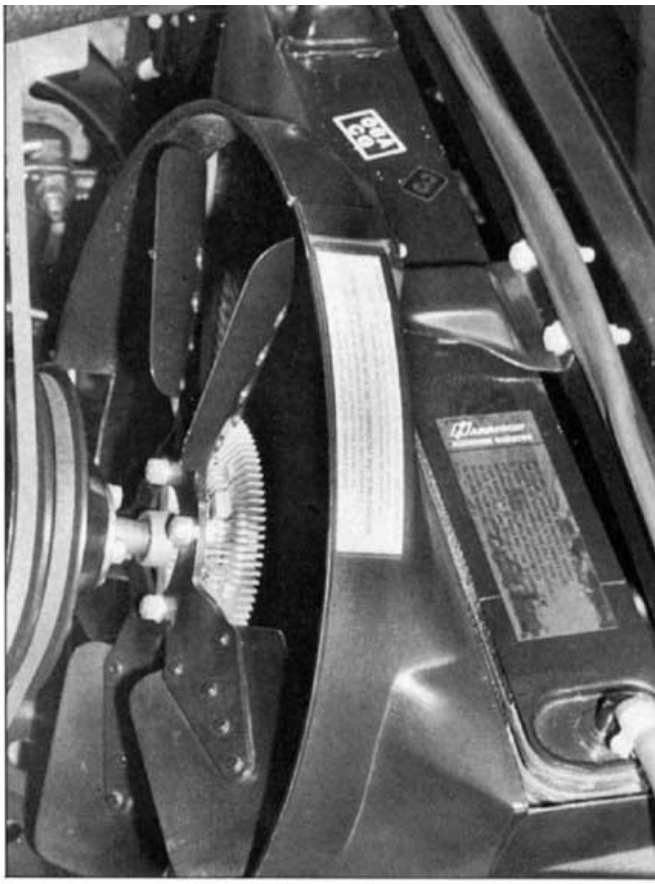
■ PEACE OF MIND ■

COOL DOWN



Beat the overheating scourge with a ridiculously simple clutch fan adjustment

By HENRY MOLATCH

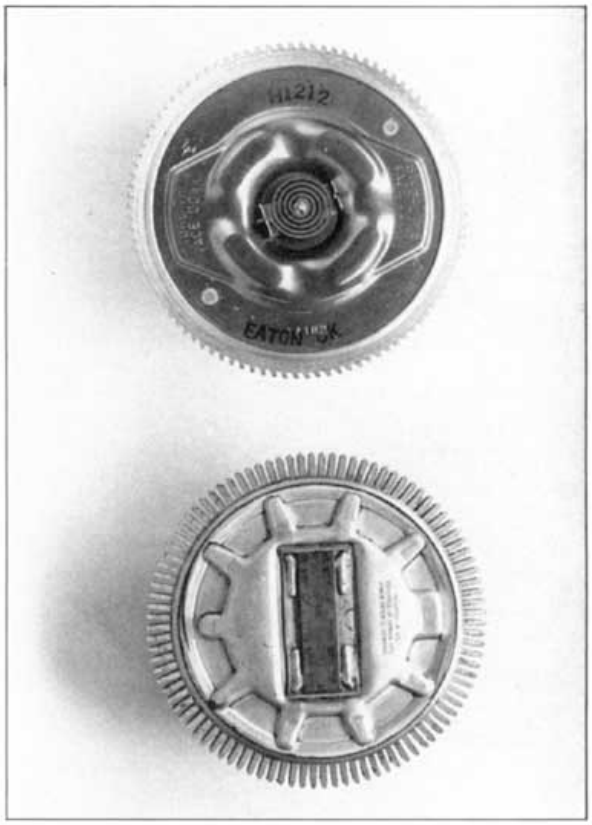
Photography: BILL ERDMAN

WHAT'S WORSE THAN THE HEARTBREAK of Psoriasis? The frustration of an overheated Corvette. Big blocks are more prone to this condition than small blocks, but now there's a cure. One that has shown remarkable results.

Up to now, if your Vette ran hot, you checked for things like a stuck thermostat, bad water pump, clogged radiator, collapsed hoses or even blow-by finding its way into your coolant. This last condition causes coolant foaming which drastically reduces heat transfer of the coolant in the radiator.

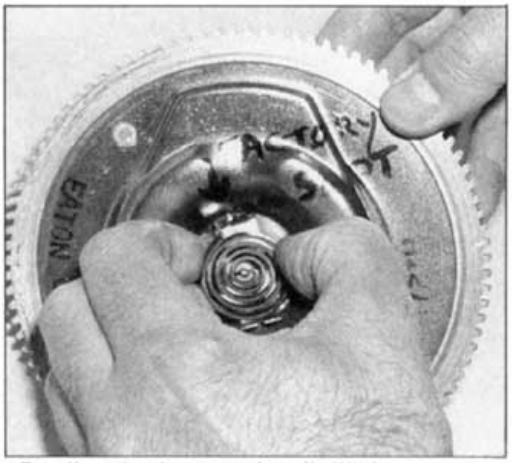
One thing that's usually overlooked is the fan. Older cars used direct drive fans. In this case the fan blades are attached firmly to the hub, which is bolted to the fan pulley. Later model cars used a clutch fan. Here, the direct drive part of the clutch is attached to the belt-driven fan pulley, but the fan blades are attached to a second section of the clutch unit which is driven via a fluid coupling between the two units, much like the arrangement in an automatic transmission torque converter.

Clutch fans slip to varying degrees under all conditions. When the engine is cold, slippage is at a maximum and friction is at a minimum. This reduces the horsepower needed to drive the fan and lessens the noise of the fan pulling air through the radiator. As the engine temperature increases, a thermostatic valve inside the clutch regulates the hydraulic action to increase friction and reduce slip. The fan pulls more air through the radiator to increase cooling. At

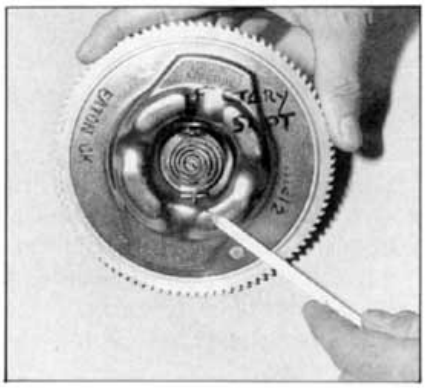


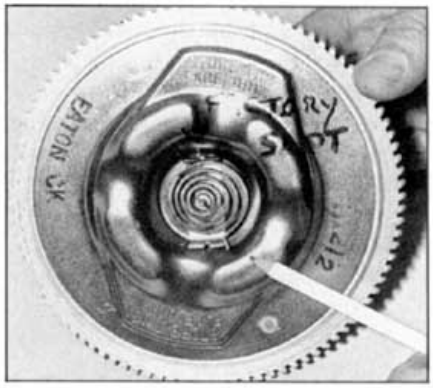
Removing the clutch fan from the car itself is merely a matter of four bolts.

Two types of clutch designs, thermostatic coil (left) and flat bi-metallic plate and plunger. The latter can be accurately adjusted to specific temperature operation, while the coil-type adjustment has the clutch running at max friction most of the time. It can easily be adjusted back to the factory setting for cold weather operation

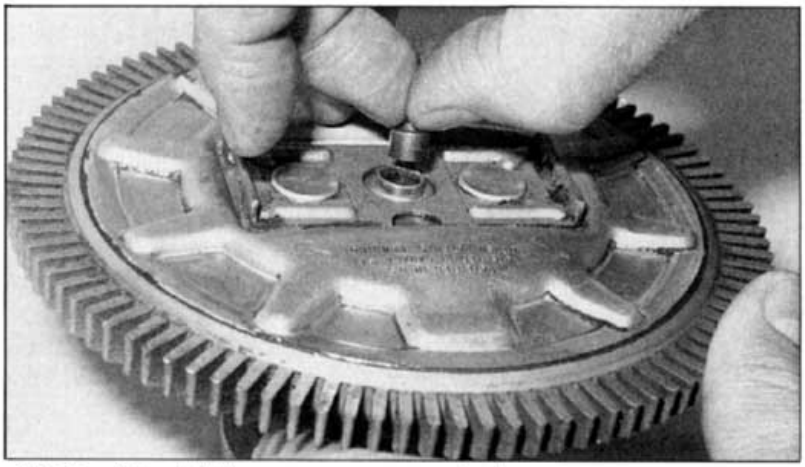


To adjust the thermostatic coil, lift the end out of the factory slot and rotate it towards the second slot. You will be rotating the valve, which turns only in the one direction when you're making this adjustment. You'll fell a lot of resistance if you try and rotate the coil in the wrong direction. You'll also notice that the valve itself will not be rotating.

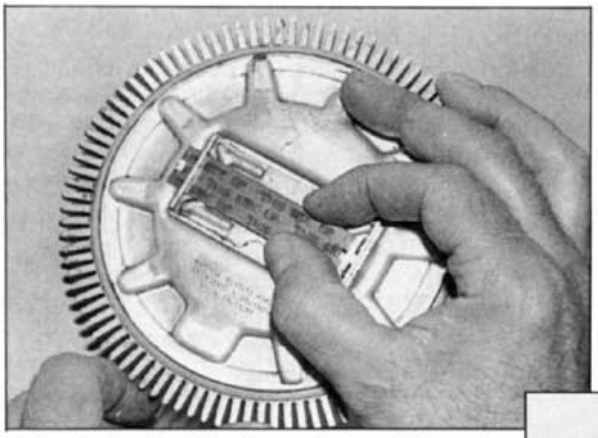




With some of these clutches, you'll be able to rotate the end of the coil all the way into the second slot using slight pressure. In others, there is no slot in the opposite tang, so rotate the spring to let the end rest against the tang. In either case, you'll get maximum cooling at lower temperatures than the factory setting.

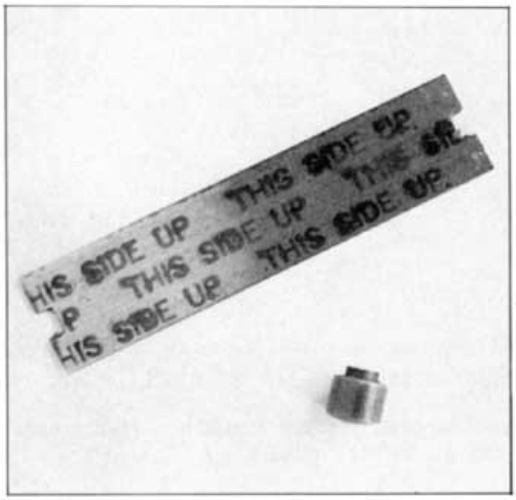


With the plate out of the way you can remove the brass plunger from the clutch.

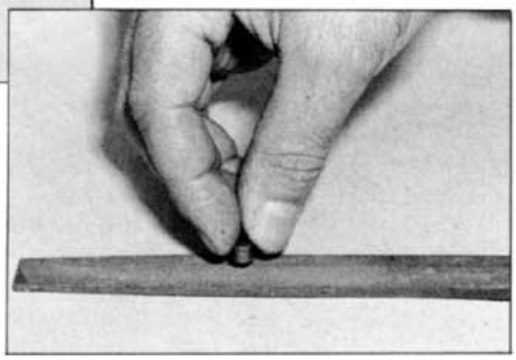


(above) The flat plate/plunger design clutch works by the plate bowing out towards the radiator as the temperature increases and allows a brass plunger to move slightly. This controls fluid flow in the clutch and increases friction. To adjust this clutch, remove the bi-metallic plate. Do not bend the tabs that support the plate at either end. The small cut in one of the tabs will allow you to press down on the plate until it clears the cutout. Then slide the plate about 1/8" until the end clears the tab. The plate can then be lifted over the tab and slid out of the second tab.

(left) The first step in shortening the pin is to accurately measure the length before starting. Use a micrometer or vernier calipers for this.



(left) The key to the adjustment on this type of clutch is the length of the pin attached to the head of the plunger. Shortening the pin will lower the temp point of max friction .005" = 10 deg F. So if you shorten the pin .015", you lower the temp from about 210 to 180 degrees. You might try first shortening the pin on .010" for a setting of 190 degrees to keep the noise of the air being pulled through the radiator more acceptable. You can always take off more later on. Make sure when you reassemble the clutch, you install the plate with the correct side towards the radiator. This usually marked by the factory, but if not, you should mark it.



The brass pin is relatively soft, so stroke it gently along a file. Check your measurement every couple of strokes to avoid shortening too much. Don't use a grinder to shorten the pin and don't grip it with a pair of pliers or you'll burr the surface. The plunger has to slide easily in its housing. Smooth the pin with emery when you've filed it down to the correct length.

COOL DOWN

maximum friction, the clutch is still slipping, but only 1/3 as much as it does at minimum friction.

As a side note, you might think that a direct drive fan with virtually no slip will cool better than the clutch units. The amount of air pulled through the radiator is as much a function of blade design and angle as it is of fan speed.

Clutch fans can go bad, as they can leak hydraulic fluid or have passages clog up. The factory shop manual has an involved test for clutch fans which requires that you overheat the engine by blocking the radiator. But a simple test you can do to test clutch friction is run the engine a couple of minutes while engine is *below* its normal operating temp. Shut off engine from idle speed while watching fan. The fan should continue rotating three or more full revolutions after the engine has stopped. Now try the same test when the engine temperature is high so the clutch is in its maximum friction mode. In this case, the fan should stop rotating in less than three revolutions. In some cases it will rotate less than one revolution. If the fan continues to rotate freely after you adjust it or at high engine temperatures, the fan is probably defective and should be replaced.

1967 and earlier Corvettes use 180-degree thermostats (some were fitted with slightly lower temp thermos). The clutch fans on these models are designed to operate at maximum friction at about 190 degrees. Some older designs went to max friction at 160 degrees. If everything was working right, temperatures, even on big blocks, would rarely reach 200 degrees even in warm weather.

Most '68 and later Vettes use 195-degree thermos (some were fitted with 180-degree units). Clutch fans on these cars are designed to achieve maximum cooling at 210 degrees. The reason the clutch fans were set for max friction well above thermostat temperature was to reduce fan noise. Also, higher operating temperatures helped in meeting emissions requirements.

A problem with the fan at maximum friction when engine temps are well up there is high underhood heat which promotes fuel percolation and drivability problems. The heat also deteriorates hoses, gaskets, wire insulation, etc.

Then there's the psychological factor. You know how much more enjoyable driving is when the temp needle is sitting on 180 rather than 220.

Here's another little tidbit. Install a new clutch fan in a pre-'68 Vette and chances are the car will run hot. Thanks to the GM parts reduction program, what you're actually getting in most cases is a clutch designed for '68 and later, calibrated to give maximum cooling at about 210 degrees. Much too hot.

So much for problems. How about a nice, easy solution. A simple adjustment to the clutch fan will make it go to maximum cooling at a lower temperature. We've done this to several cars, mainly mid-year big blocks, with dramatic results. Cars that were running at 220 degrees on the highway dropped to 180. This adjustment is so simple it can be done right on the car.

Clutch fans come in two flavors, the difference being the thermostatic device that turns the valve to regulate the internal fluid flow which, in turn, regulates clutch friction or slippage. Type A uses a straight, flat bi-metallic strip that controls the movement of a small brass plunger. Type B uses a coiled metal strip, fixed at one end and a rotating valve attached to the center. ■