KINGPIN BUSHINGS ARE SUPPOSED TO FLOAT

by DALE PEARMAN

FIGURE 1 shows a scene that is commonplace around my shop. It shows yet another time I am replacing the kingpin and bushing set on my 1962 Corvette. The front suspension is the same (virtually) for all 1953-63 Corvettes, 1949-54 passenger cars, and certain Chevrolet trucks. General Motors designed this suspension for bias ply 6.70 x 15 inch tires mounted on 15 x 5 or 5½ inch steel wheels. These old tires weigh about 22 pounds and the wheels about 20 for 42 pounds total. The tire cross section (tread) measures about 4½ inches. When one yields to the macho urges of a big-fat tire mounted on a "Star-Treck" rim, care must be exercised to avoid increasing the unsprung weight unduly since the added weight will degrade the handling characteristics of any sports car and especially straight axle Corvettes. Some may ask, "How much performance is required to get my Corvette on and off the trailer?" I'm talking of course about those Corvettes that are still driven vigorously and enjoyed to the fullest!

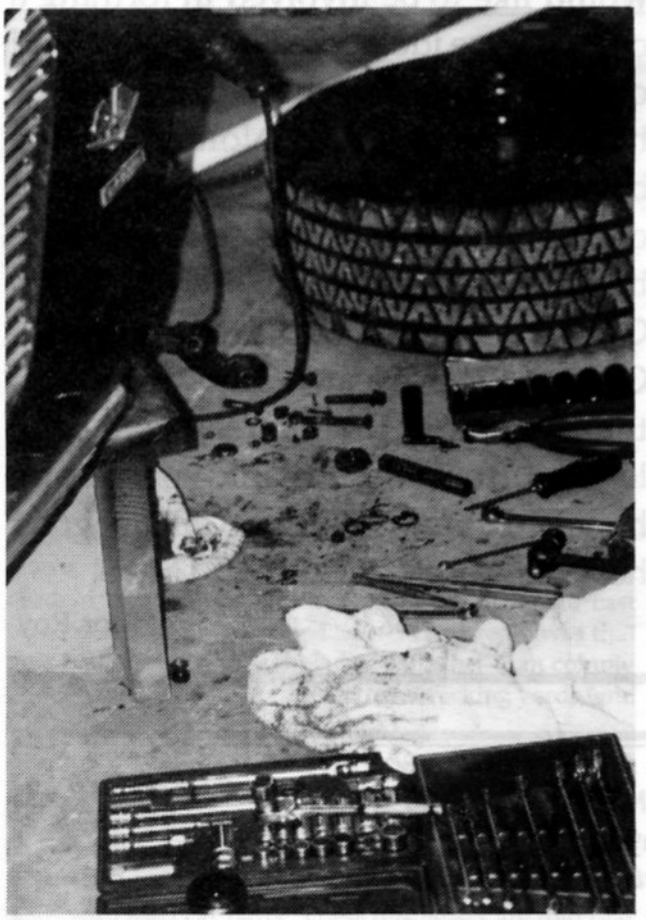


Figure 1

When I first set about improving on the work of hundreds of G.M. engineers, I was careful to select a lightweight wheel and tire set. I chose a Michelin Sport XGT P235 60 VR15 and a 7 x 15 inch steel Police wheel. the combination, at 48 pounds increased my unsprung weight by 6 pounds. Since I replaced the R.P.O. 687 front axle brake system with disc brakes, I made up the weight increase of the wheel and tire with a few pounds to spare.

These tires measure 8½ inches across the tread and are made of a hard rubber for very long life. They are GREAT wet weather tires and GOOD dry weather tires. They provide a rock solid ride around corners and on the straight as well. The rubber is very forgiving up to a point. When you exceed the adhesion limit they unhook and there's no coming back! When this happens you had better be in a place where there are no obstacles because you will do at least one 360 degree turn-around. I am preparing a story with skid-mark photos of a routine trip to work one morning. I use the small "dog-pan" hub caps and this set-up looks great on the car!

METAL ON METAL SUSPENSION

General Motors recommends lubricating 22 grease fittings on your front end every 1000 miles or every Saturday morning, whichever comes first. These old suspensions used kingpins and bushings instead of ball joints. The whole suspension is bushed metal-on-metal. Figure 2 is a photograph of a steering knuckle and spindle with kingpin, bushings, thrust bearing, shims, and inside the bag are welsh plugs, dust caps, retainer bolts, and nuts with lock washers.

Figure 3 shows the steering knuckle holder. Figure 4 is a G.M. drawing of how it all fits together. My knowledgeable frind, Paul Adams has for years insisted that since my tires are twice as wide, I need to lubricate the front suspension twice as often or every 500 miles. The reason is that the wider footprint sees more pavement surface irregularities and causes the suspension to work twice as hard. I have come to believe Paul, (although with some reservations) after having replaced my kingpin bushings three times in less than 100,000 miles!

Figure 2

The failure this time is NOT due to lack of grease. It is due to incorrect installation technique. I have learned that the practice is called a "California Shim" and I have seen Corvettes repaired this way on several occasions. Only my passenger side bushings failed. About a year and a half ago I was in the process of building my restoration shop and didn't have time to fool with replacing kingpins and bushings. I instead paid a "professional" $50.00 per hour to renew both sides. While in the waiting room I looked in horror past the "NO CUSTOMERS ALLOWED" sign to see this man hammering the inside of my steering knuckle with a center punch! "Hey", I yelled lunging for the hammer, "that's where the bushings go!" "take it easy", Mr. Manager said rushing to the bench between me and the mechanic. "Come into my office and I'll explain what he's doing. Insurance regulations don't allow customers in the work area."

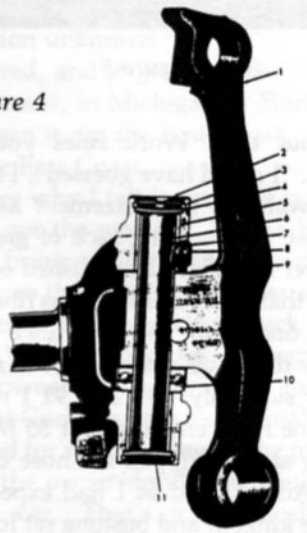
Figure 3

Once inside, Mr. Manager explained that "Spike", (not his real name) was roughing the inside surface of the knuckle to hold the bushings captive! "We always do it that way", he said, "you see this here hole in the bushing?", pointing to a bushing as shown in figure 5. "That's where the grease squirts in from the grease fitting and we line it up so the grease goes straight through and into where the kingpin is and that makes it last a ho-lots-longer. I know what I'm talking about cause we been here 35 years. If these bushings can turn in the knuckle the hole won't line up anymore." For one split-second I was almost won over by this semi-intelligent argument!

NO LOANERS CARS HERE

"How about loaning me your car so I can go home and get my ST-12 Corvette Servicing Manual and I'll prove you wrong", I said. "Sorry, insurance regulations don't let me loan you a car" was the reply. By this time Spike was installing the steering knuckle back on the car. "Look here", I said, "Do you see this groove around the bushing? The grease fitting empties into this groove (if you install the bushing right side up) and the purpose of the hole is to allow the grease to pass under pressure to the inside of the bushing where it fills the spiral groove. It makes no matter at all what the orientation of the bushing is, relative to the greas fitting, as long as the groove falls under the fitting! I'm positive that these bushings are supposed to be free to rotate as they please! I insist that the driver's side be done my way or I don't pay!" "OK, OK", Mr. Manager said, "but you are making a big mistake. We won't give you a guarantee on the driver side. You know Mr. Varooom, Spike is a graduate of the B.B.I.E.!"

Figure 4



I quietly remembered seeing Spike's diploma hanging next to the girlie calendar near the men's room and had wondered at that time if the B.B.I.T. stood for "Bugs Bunny Institute of Technology!

At any rate, Spike did the job my way on the driver's side and all that remained was for the dust caps and hub caps to be installed and I would pay my bill and be on my way. All of a sudden it was "LUNCH"!

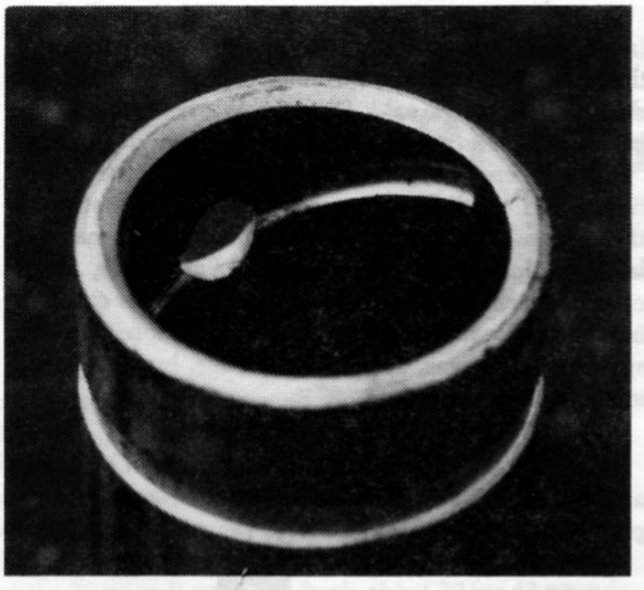


Figure 5

"Sorry about that. Work rules you know", Mr. Manager said. "I could have guessed", I replied. For the next hour I watched in amazement as Spike gulped down the most ugly looking rack of greasy, dirty ribs that I have ever seen! He also polished off a thermos of whatever it is that Spike drinks. I was finally on my way at ten after one with the assurance that I had a professionally done job warranted for ninety days on the passenger side only. On day 91 I noticed a slight vibration in the front end at about 55 M.P.H.!

Back at my shop I "upped the nose of my Corvette a-la-Noland Adams[1] and as I had expected found the passenger side kingpin and bushing set loose. I returned to Mr. Manager and Spike, both of whom didn't believe me until they checked it out themselves. "Gee", Spike said, "that's the first time a customer ever complained like that. Did you hit a curb or something?" Mr. Manager said, "Well, the repair is unfortunately out of warantee but to show you what good guys we are, I'll give you the labor free if you'll buy our parts". He charges $92.50 for both sides ($36.00 at NAPA) and of course regulations won't let him split up a kit! I asked Mr. Manager if he knew how to fly and if he could conceptualize a rolling doughnut! I was then OUT OF THERE. Enough of Spike, insurance regulations, greasy ribs, B.B.I.T. et. al.!

SPIKE AND HIS CENTER PUNCH

Figures 6 and 7 show the "California Shim" damage to the steering knuckle caused by Spike and his center punch.

Figure 8 shows how the bushings were deformed to remain motionless. Notice the wear-marks inside the bushings where they rotate about the kingpin. I managed to remove the burrs inside the steering knuckle with minimal damage to the bore diameter by using a rolled-up sheet of 360 grit paper as shown in figure 9.

Now the bushings turn freely in the knuckle and about the kingpin as well. Q.E.D.! Figure 10 shows the assembly back on the car. I installed the steering knuckle first without a shim. I used my built-in feeler gauge to determine that a shim was needed. (I grabbed the spindle and wiggled it while proclaiming that I could "feel-er" was loose by 7 to 10 thousandths.) It felt like crankshaft end play that's not just right! (click-click). Ultimately two shims were needed to tighten up the clearance between the holder and knuckle.

I cut an old kingpin in half and used it from the top to align the two shims while installing the bearing from the bottom with "goose grease and some degree of difficulty". Note that there is a right-side up with this thrust bearing. After I finally wiggled the bearing in place, I installed the kingpin from the bottom with no problems. Figure 11 shows the single shim that Spike didn't bother to align. Figure 12 shows a brake cleaner that works every time with straight axle Corvettes.

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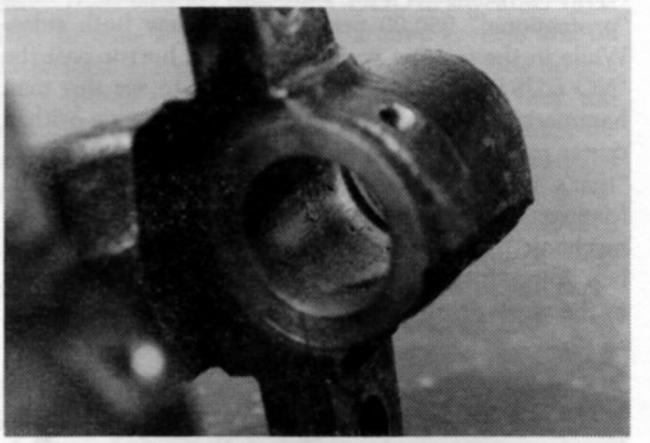

Figure 6

Figure 7

1. "Upping-the-nose-a-la-Noland" is a technique for jacking up the front end of your Corvette in such a way as to avoid stressing the third arm bearing carrier, Noland identified improper jacking and loss of steering control with resultant catastrophy in "STRAIGHT TALK", Vol. 3, No. 4, Pg. 6, Summer 1990. (Idler Arm Brackets-Safety)

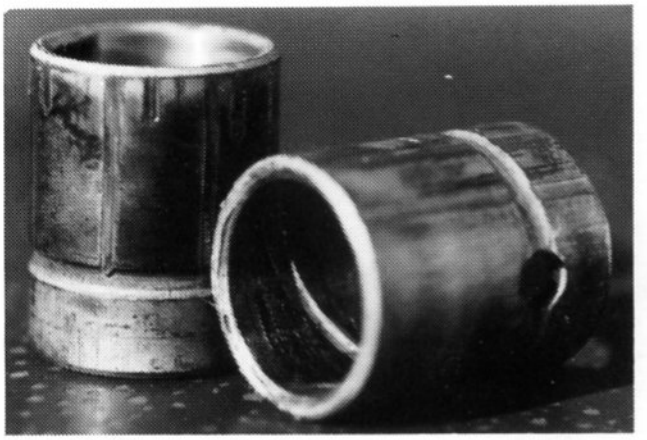

Figure 8

(continued from page 4)

Replacing a kingpin and bushing set is a very easy job provided that no heat is needed to free the kingpin. See CORVETTE RESTORER MAGAZINE, Vol. 12, No. 1, Pg. 14, Summer 1985, "Kingpin Replacement The Way It Really Is", by Rogers Stevens with torch in hand. I feel that the most disagreeable part of the job is all the grease and dirt but this problem is minimized with the brake cleaner! The CORVETTE SERVICING GUIDE ST-12 gives complete directions under section 3-13, Front Suspension. Mike Ernst lists parts manufacturers in CORVETTE RESTORER MAGAZINE, Vol. 8, No. 3, Pg. 28 and a very good exploded drawing is shown from Chilton's in RESTORER, Vol. 10, No. 2, Pg. 46. For that matter see CHILTON'S REPAIR MANUAL as well.

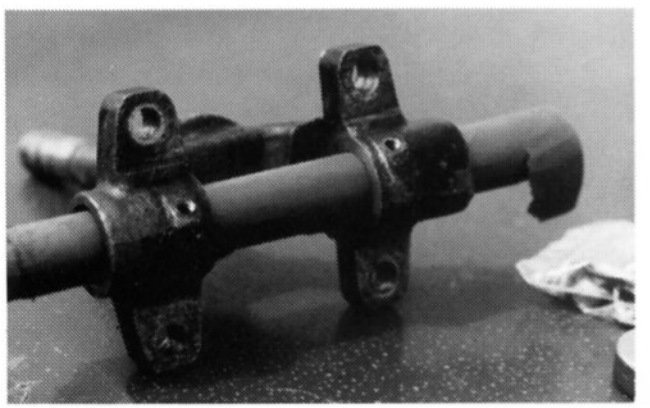

Figure 9

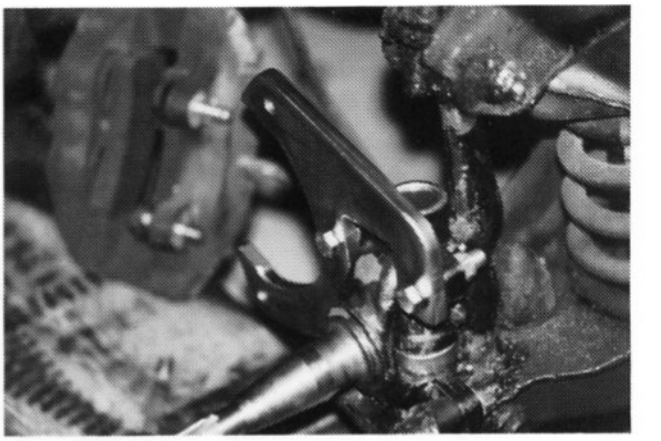

Figure 10

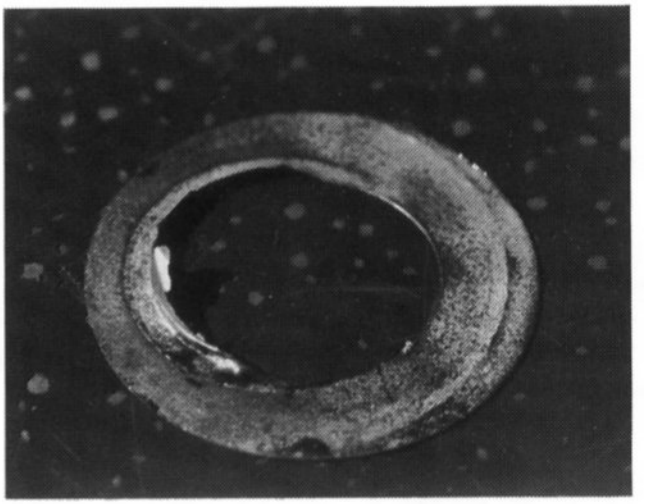

Figure 11

As I mentioned, I employ disc brakes on my front axle. I intend to write about this mutilation in the near future. It's a super-duper thing to do with all street driven early Corvettes. In the meantime grab your wheel at 6 o'clock and 12 o'clock and wiggle it! (Jack up the car first of course). If your "feeler" gauge feels like it's loose, inspect the kingpin play. Don't hesitate to tackle this simple job. If you need help call me and if you want, I'll set up an appointment for you with Spike!

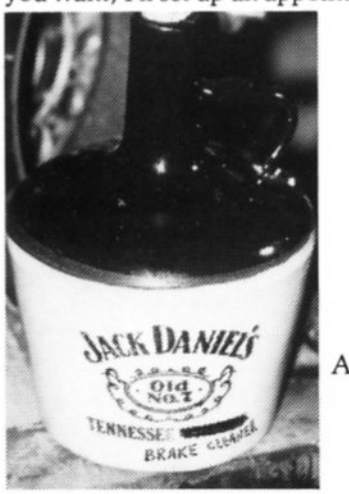

Figure 12

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