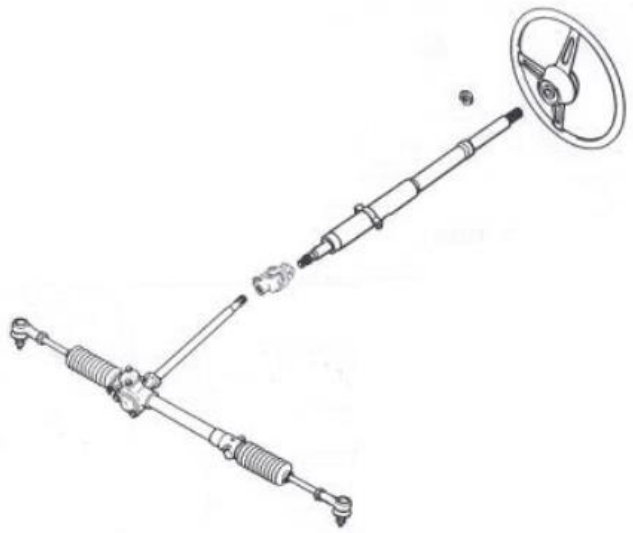

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Collapsible steering column

Mike Macartney has been rebuilding a rubber bumper V8 Roadster conversion and supplying a popular series of rebuild reports which have been released on the V8 website. In one of his reports he described the maintenance undertaken on the collapsible steering column. Here we expand on Mike's report with an illustrated note on the steering column and how the maintenance can be carried out. (Nov 16)

Collapsible steering columns

They were introduced to reduce the number of serious injuries caused by the impact of the steering column and steering wheel on the driver's body where their car was involved in a frontal impact collision. To improve driver safety innovative changes were made to steering columns so they collapse on frontal impact.

The collapsible steering column still has a long shaft connecting the steering wheel to the steering rack but the column has an inner and outer sleeve with a number of bearings contained between each sleeve. On impact, the sleeves will compress much like a telescope so the column will absorb the energy produced during impact by collapsing. On the MGBGTV8 and later MGB models a collapsible steering column was fitted as standard equipment during the construction of the car. Replacement parts catalogues list the parts for the MGBGTV8 as BHH806 (chrome) and BHH1596 (rubber). For the MGBGTV8 a universal joint (AHH6000 – chrome and 575732 – rubber) was necessary. Below the universal joint is a solid section of the steering column which connects to the steering rack. This combination enables the steering column to pass the V8 engine and reach the steering rack.

Wear on the collapsible steering column

In his rebuild report, Mike Macartney says "it seems that all too often the collapsible steering column on MGBs wear out long before the rest of the car does, and when the rest of the car is refurbished or rebuilt, the steering column is ignored. Often it is because the Factory never offered any replacement parts, so when they wore out, you either had to find a replacement column or you just had to put up with the worn parts. The ball bearings used from the Factory on the lower bearing were cheaply made and of an odd size that is not readily available.

Another problem with these columns is the telescopic joint in the steering shaft. In order for the steering column to be able to collapse in the event of an accident, both the outer steering column housing and the inner shaft have to be able to collapse. The outer housing is perforated to provide for easy collapsing. The shaft is designed to telescope within itself upon a collision. The shaft itself is made of two pieces. One, the outer tube is basically a hollow tube with a modified socket to receive the inner shaft. The inner shaft is solid, and threaded and splined to attach the steering wheel at the top. At the lower end the inner shaft has two flats formed on the sides to match the outer tube. There are two recesses around the inner shaft in the area where it fits into the outer tube. At the Factory these recesses were filled with a tough plastic to act as friction material between the inner and outer shaft. Often, if someone disassembles the steering column, the plastic is broken into pieces and cannot be reinstalled.

The two parts of the inner collapsible steering that slide inside each other in the event of an accident with the broken bits of plastic that hold the column at the correct length. These I replaced with small screws to hold the two parts together.

Examining a collapsible steering column

I was going to replace the bearings in the collapsible steering column. There is a ball race at top of the column and loose balls in a track at the bottom held in with a clip. A large spring and circlip hold the whole lot in place. There is also a circlip at the bottom of the top bearing to stop it moving. When I tried to purchase the bearings I found that you could only buy the late date rubber bumper MGB steering column complete, if there was any stock available! Undeterred, I decided to rebuild the steering column.

When I cleaned up and oiled the bearings they turned out to be useable with very little sign of wear. The main problem with the column was that the inside shaft was sliding up the outer shaft easily, which it shouldn't. It is meant to stay in place and only slide up when the crumple zone part of the outer steering column casing buckles up, in the case of a front end crash.

So some time ago I took the steering column apart to find out the problem.

This photo shows the crumple zone part of the steering column where my right hand is holding the column. The three aluminium 'bits' are the top bolts mountings for attaching the steering column to the bodyshell by the dashboard.

The bolts for the steering column lock are 'shear bolts'. When the steering column was fitted in the Factory, the spanner part of the bolt shears off, leaving no means to remove them. This is to slow down thieves. If you centre punch an indent in the dome that is left, then tap the centre punch anticlockwise you can usually manage to undo these two bolts. The column will then come apart and repairs can begin.

The part I am holding is the inner steering column that I need to repair.

Unfortunately, I forgot to take photos before I repaired this part. Normally, there are some pins where I have installed the 4mm screws. They fit into some plastic inserts in the bit underneath the screws you can see in the photo. What I have done is tap the holes where the pins fitted and replaced them with screws. The column should then still collapse in an accident. The screws just press on the inner shaft and have stopped the inner shaft sliding about.

Below is the spring that holds the centre steering column in place. The circlip at the bottom looks as if I need to replace it. As it is not available from MG suppliers I will

have to find a suitable circlip in my box of circlips of various sizes. Each side of the spring is a washer, or spacer.

The top bearing is held in place with another circlip. There seems to be two groves each side of the bearing. In the bits I took off, ages ago, there appears to be two circlips, but there is no way this second circlip will fit in the groove as the bearing covers it?

Over the bearing sits a rubber collar to take up the space, and make the bearing fit in the outer column. It looks like a bit of a British Leyland bodge to me, but I suppose it got them over the problem of having a special bearing made to the correct dimensions.

I don't know why, but I hand painted the outer steering column. My brush painting is not very good. At least with satin matt black the brush strokes don't show up as much as they do with gloss paint.

These are the parts that need to find a home back on the steering column.

Now the paint is dry on the outside of the steering column I can get to work trying to put it back together. Advice for others – It is much easier if you take bits apart and repair them there and then, rather taking them apart and leaving them for some period of time before you reassemble. In this photo above, you can see where the cut out is in the outer steering column and the slot in the inner shaft where the actual locking parts sits.

I wiped the bearing cover with Vaseline to help the bearing and its cover (spacer) to slide into its correct place inside the outer column.

Then appeared the first problem

The inner shaft would not slide down the outer steering column. The M4 screws I had used had too larger heads on them.

Out came the grinder to grind off most of the head. This does not really matter as I was only using them to hold the inner shaft to the outer shaft. The problem will come if I didn't fix them in the correct place!

At last, I found out that you do need two circlips to hold the top bearing in place. The standard bearing that BL used was also not the correct size for the steering column shaft. You can see in this photo the 'O'-ring that they added to the shaft to stop the inner race of the ball race rotating on the shaft. Another BL bodge!

The bearing and spacer were pushed into the outer steering column at the top where the steering wheel goes and the circlip pushed down to sit in the second circlip groove.

The bearing, spring and circlip at the bottom of the steering column will hold the inner steering column shaft in its correct position.

Now came the next problem

How the hell am I going to push on this large spring and get the circlip to fit, all at the same time? Time for a cuppa and some thoughts. I think I will need some help with this. This is a trick I have used in the past, wiring the spring in the fully compressed position. I put the spring in the vice to compress the spring and tied it up with wire. The problem was that the wire would not let the spring drop down over the inner shaft.

I got Jane to come and help me with the circlip. I held the spring back with a couple of screwdrivers whilst she tried to fit the clip in place. After about ten attempts I gave up that approach to the problem. The spring that BL used, back in the late 1970s, looks to me far stronger than it needed to be. Looking on the internet the other week I found a site in America saying that the problem with these steering columns is that the ball bearings at the bottom break up. This I think is probably due to the high pre load that the spring is imparting on the balls.

I went and had a look to see if I could find a weaker spring of the same diameter that I could use. No Joy, I had nothing like it. To decrease the load on the spring I decided to cut 1/8" off the bottom of the steering column with a Dremel cutting disc. I also put the spring on the finisher to make the end of the spring flatter so I could hold it in place better with the screwdrivers.

Then the bell rang. No, not seconds out, third and final round! It was Robert, of Saga Louts fame. He was an engineer so would prove useful in my hour of need.

The amount I had cut off the outer column was just enough for Robert to hold the spring in place, and for me to fit the circlip. Success at last.

Yes, I did fit the rubber and plate the wrong way round in my excitement of getting the column together at last. This was easily rectified without having to take the column apart again.

The next job was to bolt the steering lock back onto the other steering column. This photo shows clearly the 'shear bolt' holding the lock onto the steering column.

I have not tightened the steering lock fixing bolts to the shear point, just in case I need to take it apart again or the steering lock needs replacing in future.

It was easier fitting the steering column to the body with the shell upside down on the spit".

What is purpose of tough plastic as a friction material between the inner and outer shaft?

Nic Houslip notes that "when I dismantled the column in my 1978 shell V8 Roadster I faced the problems that Mike did and my repair followed the same route. I concluded that the plastic filler was probably injected under pressure into the spaces on assembly. Provided the pins or screws are thin enough I'm sure this will work satisfactorily, brass screws rather than steel would be a more suitable choice as they will shear more easily in the event of a crash. Nylon screws might be an even better solution if available as there is no axial load on the assembly in normal use.

Reason for the universal joint on the steering column
Because the pinion of the steering rack needs to be near enough to the centre of the car to allow the steering rack teeth to have sufficient movement to turn road wheels from lock to lock, but the designers ameliorated the problem by using a pinion with gear teeth cut at a slight angle rather than parallel to the axis of the steering column. The primary reason for the angled teeth is probably more connected with not needing it to pass through the engine block but also the life of the teeth as the sliding motion is spread over a larger tooth area, just one of those happy coincidences that make the compromises that are inevitable in design easy to work within. This however means that if you extrapolate the pinion shaft's path upwards it would probably enter the cabin and protrude through the instrument panel just to the right of the speedometer! Having the UJ enables the steering column to be mounted conveniently for the driver's seated position and to correct misalignment of the two shafts. It also provides a degree of protection since if the front of the car is extensively damaged and the cross member pushed back, the forces will not be transmitted directly up the steering column.

Footnote
This V8NOTE is taken from the comprehensive set of over 100 illustrated notes contributed during the restoration of an MG V8 Roadster made by Mike Macartney. You can see those notes on the V8 website:
https://www.v8register.net/profileV8RebuildMacartney.htm