

TECHNICALLY

speaking

This article should be considered in conjunction with the notes written by Mel Carey recently relating to the correct use of the Club's Spare Parts and with the Workshop Manual. It does not replace the Manual, merely provides supplementary information.

The success of the introduction of volume - produced front wheel drive cars during the 'twenties and 'thirties was dependent to a large extent on the availability of an efficient and reliable means of transmitting the drive to the front wheels.

The problem of driving through a wheel that is also steered and sprung has exercised the minds of engineers over many years. One can, of course, drive through fixed front wheels and steer with the rear - a solution used for most fork lift trucks, but hardly suitable for even moderate speeds, and in any case, why not turn the driver's seat around and drive the other way? The advantages of front wheel drive in terms of stability, traction

OF DOUBLE YOKES, CARDANS AND SPIDERS.

and space utilisation have been recognised by most manufacturers, eventually, and the development of reliable front driveshafts has been vital to their success.

What is the problem? A typical driveshaft in a fwd car fitted with independently suspended wheels [such as a Traction] consists of three shafts. First is the gearbox output shaft, which is fixed relative to the hull, but is free to rotate. Second, the stub axle in the wheel hub which moves relative to the hull and also rotates and last the shaft that joins the first two, via universal joints.

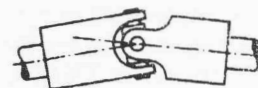


FIG.1. SINGLE HOOKES JOINT

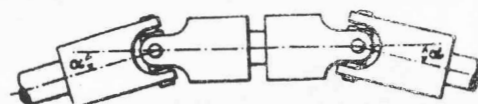
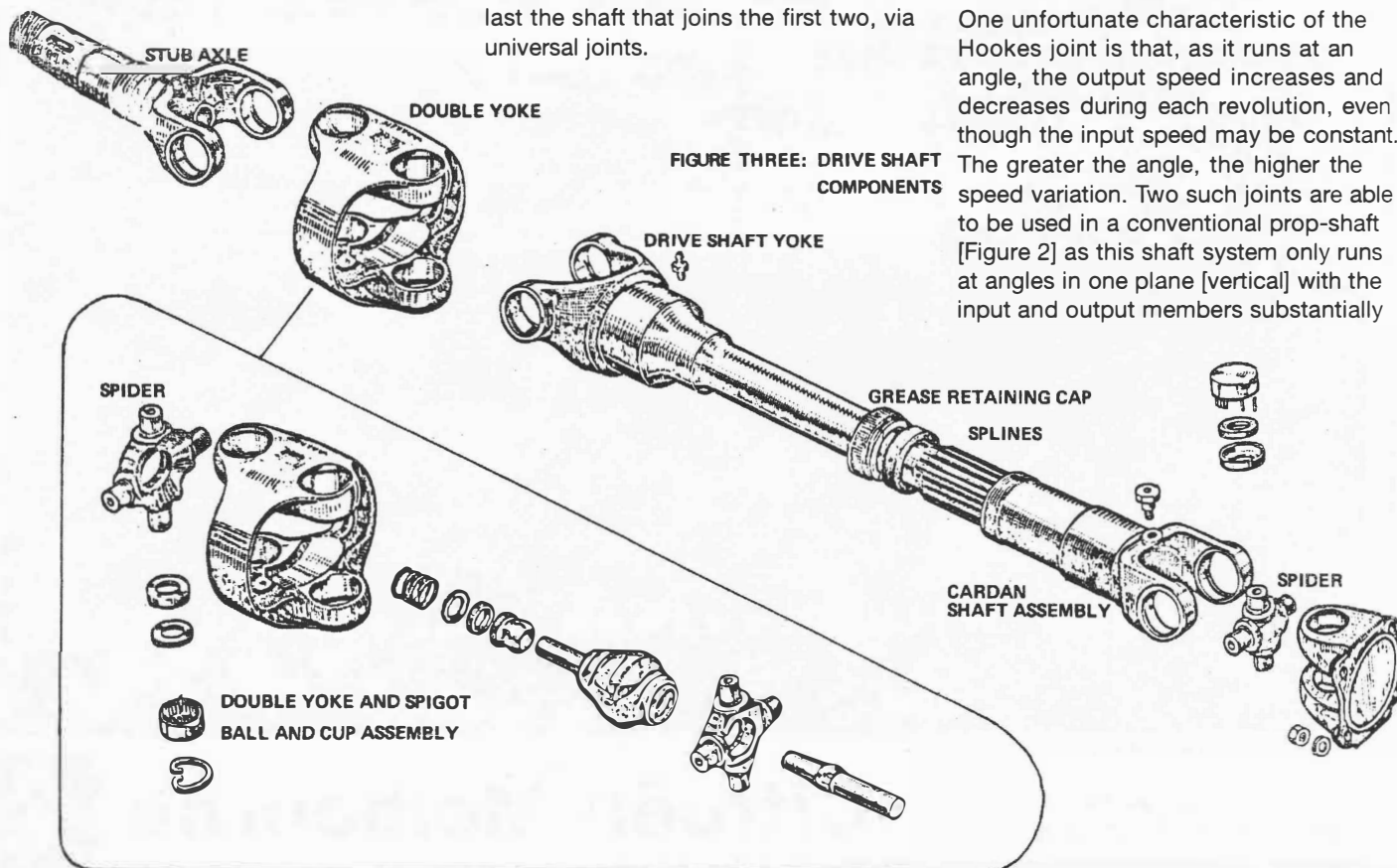


FIGURE 2. THREE SHAFT SYSTEM USING TWO HOOKES JOINTS

As the wheel moves up and down over bumps and/or is steered away from the straight ahead position, these shafts take up various angles to each other. The most common means of transmitting power between two shafts that run at an angle is to use a 'Hookes' universal joint. [Fig 1.] This is the type that is almost invariably fitted to both ends of the prop-shaft of front engine/rear drive cars and consists of two yokes at 90degrees, coupled by a cross.

One unfortunate characteristic of the Hookes joint is that, as it runs at an angle, the output speed increases and decreases during each revolution, even though the input speed may be constant. The greater the angle, the higher the speed variation. Two such joints are able to be used in a conventional prop-shaft [Figure 2] as this shaft system only runs at angles in one plane [vertical] with the input and output members substantially



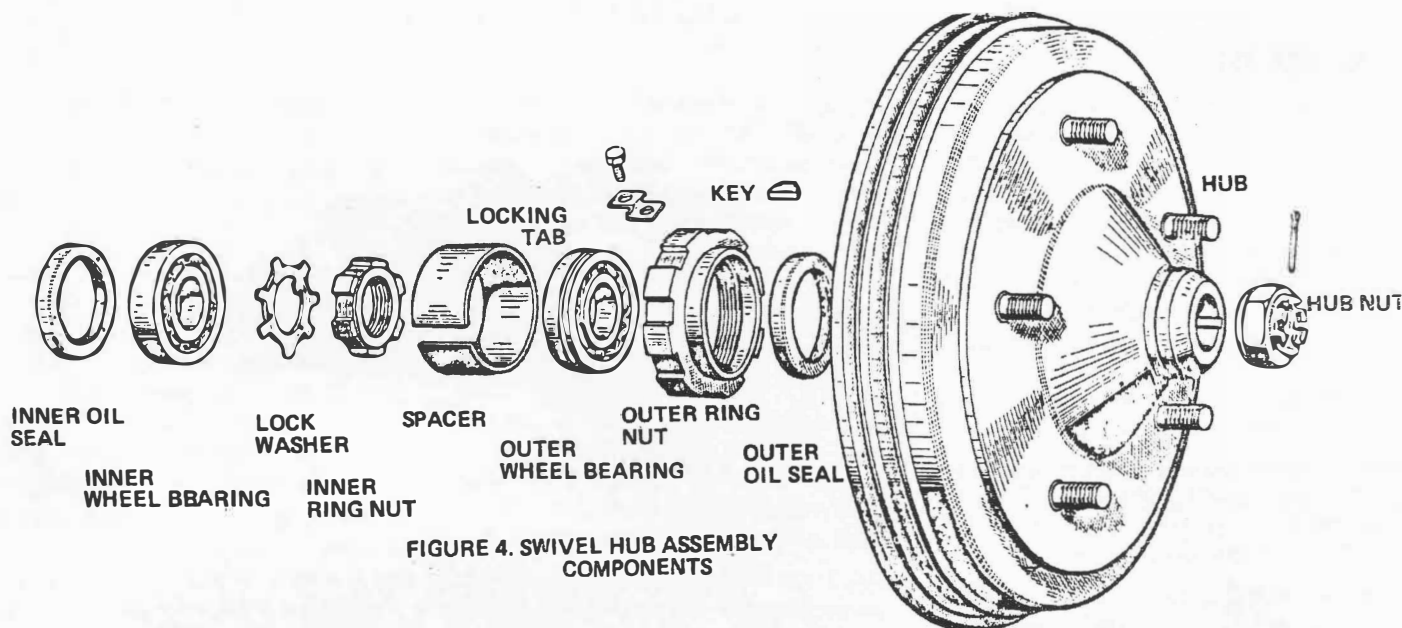


FIGURE 4. SWIVEL HUB ASSEMBLY COMPONENTS

parallel. By correct phasing of the two joints, the speed variations can be arranged to be self cancelling.

In a fwd driveshaft, however, the output shaft [the stub axle] moves in two planes - vertically during suspension movement and horizontally about the steering axis during steering. If single Hookes joints are used, then the speed variations during rotation would give unacceptable vibration and kickback through the steering column during cornering under power. Despite this drawback, the early 2CV used such a system due to its simplicity, lower cost and the vehicle's minimal power.

The solution to the problem is to use an outer universal joint that does not produce speed variations during rotation - a constant velocity joint. Many types of CV joints have been designed and the Traction was fitted with most of them during the prototype and early production stages.

The design eventually adopted used Hookes joints back to back with a centralising spigot ball and cup as the outer CV joint and a single Hookes joint at the gearbox [inner] end.

A sliding splined coupling at the inner end accommodates changes in driveshaft length during suspension movement 'All good things come to an end' - Griffith farmer. And so do Traction driveshafts, usually deteriorating until finally crying 'enough!'

Problems encountered include:

1. Shearing of hub keys - rendering the car immobile.

2. Excessive wear of universal joint cross bearings causing vibrations, snatching and clonking on lock. If allowed to continue, this can lead to breakage of the universal joint yokes with dramatic consequences, ie the car is immobile, again.

3. Wear of splines causing noise, snatch and vibration.

REPLACING DRIVE SHAFTS

The first point to be made regarding replacement is that it is impossible without the use of a number of special tools, namely: 38mm or 1" AF socket, Hub puller, Outer wheel bearing extractor [if the bearing is tight on the shaft], Inner ring nut spanner, Lower ball joint extractor.

Second point is that it helps to read the manual before getting your hands dirty.

REMOVAL.

1. Slacken hub nut [38mm socket], remembering that the threads go in different directions on each side.
2. Jack car under lower link arm and just slacken 4 inner universal coupling bolts [14mm].
3. Remove road wheel.
4. Remove brake drum using puller.
5. Unscrew outer ball race slotted ring nut [using proper tool if available or by drifting with square ended bar] after removing small lock tab.
6. Withdraw outer ball race with extractor, if necessary. Have seen somewhere that an extractor can be improvised from two large exhaust clamps, but jury-

rigged tools should be used with care as the pulling lip on the bearing is rather fragile. Remove distance piece and as much grease inside the hub as possible to reveal the inner ring nut.

7. Turn back the locking tabs of the inner ring nut and assemble inner ring nut spanner on the stub axle. Next step is to firmly prevent the drive shaft from turning as the inner ring nut can be reluctant to budge. If the special tool [1830T] is available, fine: if it is not, then select first gear and have a helper prevent the gearbox mainshaft from turning using an adjustable spanner on the starter dog. Again, unless the wrong side shaft has been fitted at some time, right hand shafts have left hand threads and vice versa, for the inner ring nut.

8. Separate swivel hub assembly from lower link arm by removing lower ball joint using extractor.

9. Separate steering arm from tie rod end.

10. Unscrew sheet metal grease retaining cap from spline coupling and disengage driveshaft/swivel hub assembly from cardan shaft by swinging it outwards.

11. While a helper supports the swivel hub assembly, carefully drift the driveshaft inwards through the inner wheel bearing with a copper hammer.

12. Prise out inner oil seal and drift the inner wheel bearing outwards through the hub bore.

13. Remove cardan shaft assembly from gearbox flange.



ASSEMBLY

If fitting secondhand/reconditioned drive-shafts, examine them and check that stub axle tapers are not scored, that stub axle keyways are not chipped or enlarged, that the splines are reasonable and threads are OK. Determine which shaft is for which side of the vehicle and check the fit of the stub axle taper in the mating taper of the relevant drum hub. This step, although time consuming, is essential if sheared keys are to be avoided in future.

Lightly blue the stub axle with engineers blue and fit into hub. The key need not be fitted but locate the stub axle as it would be if the key were present.

Tighten hub nut, then unscrew and check that outer face of the hub protrudes by a small amount from the shoulder of the small diameter stub axle taper. [If it does not, find another hub that does!]

Remove hub carefully so as not to disturb the blue markings on the bore. There should be continuous contact over bands

at both ends of the bore. If not, then lightly lap the tapers together using fine grinding paste and repeat bluing procedure until the hub is well seated. After lapping, clean both tapers with meths until wiping with a tissue produces no dirtying of the tissue.

Reassembly, is basically a reversal of the dismantling procedure, but a few points should be noted.

1. The cardan shaft/gearbox flange bolts have a habit of working loose. When assembling, clean the threads thoroughly with a degreasing solvent and apply Loctite, Grade 242 before tightening.
2. Fit new inner and outer oil seals and wheel bearings. You do not want to go through all this again for the sake of a few dollars.
3. Pack wheel bearings and oil seal recesses with a multi-purpose lithium-based grease, such as BP Energrease L2. The bore of the hub between wheel bearings should not be packed with

grease, but should have a moderate coating, only.

4. Do not use a locking washer under the inner ring nut - just tighten as much as possible.
5. When engaging splines of driveshaft into cardan shaft, coat the splines liberally with a grease containing molybdenum disulphide [such as BP Energrease LMS 210]. To ensure constant velocity it is essential that one axis of spiders in the outer universal should line up with one axis of the spider in the inner universal joint.
6. Always fit new keys between stub axle and hub. These are a fairly common general engineering item and can be obtained at most engineering houses. Try to buy keys wider than required, then reduce width by filing until the key is a snug fit in both stub axle and hub.
7. Tighten hub nuts to 216lbft and fit new split pins.

Roger Brundle.