- **SECTION 2 STRUCTURE FEATURES**

- The propeller shaft includes two structure types, one is the length-changing propeller shaft with telescopic spline, and another is the length-constant intermediate propeller shaft with middle supporting device. Refer to Figs. 6-1 and 6-2.

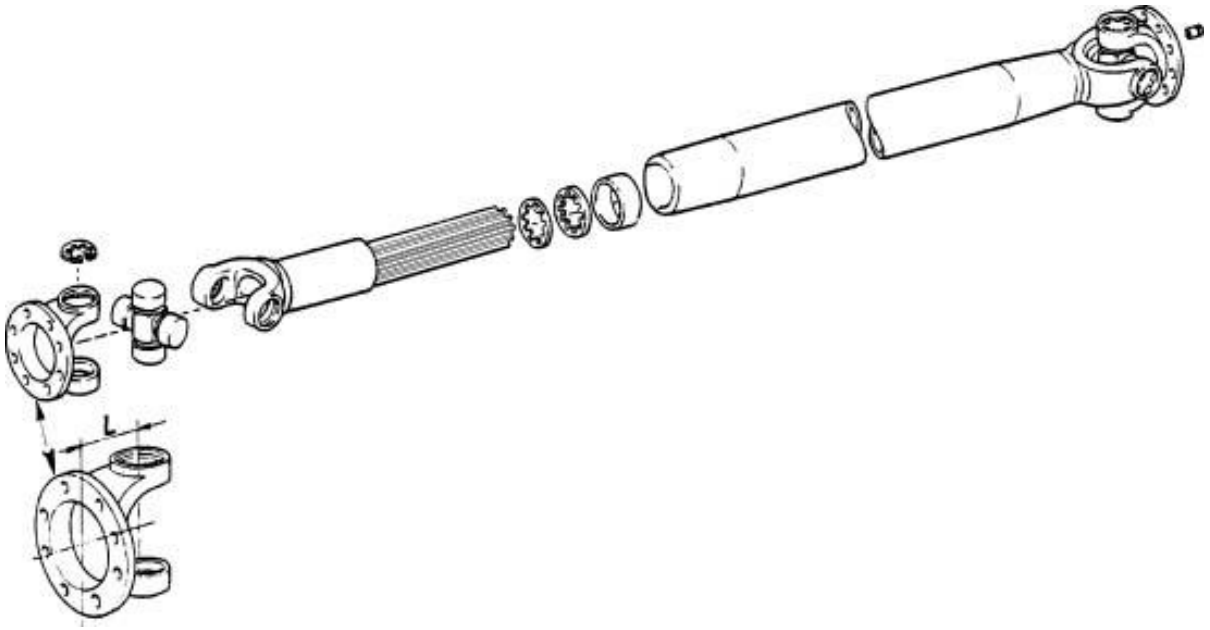

Fig. 6-1 Telescopic propeller shaft

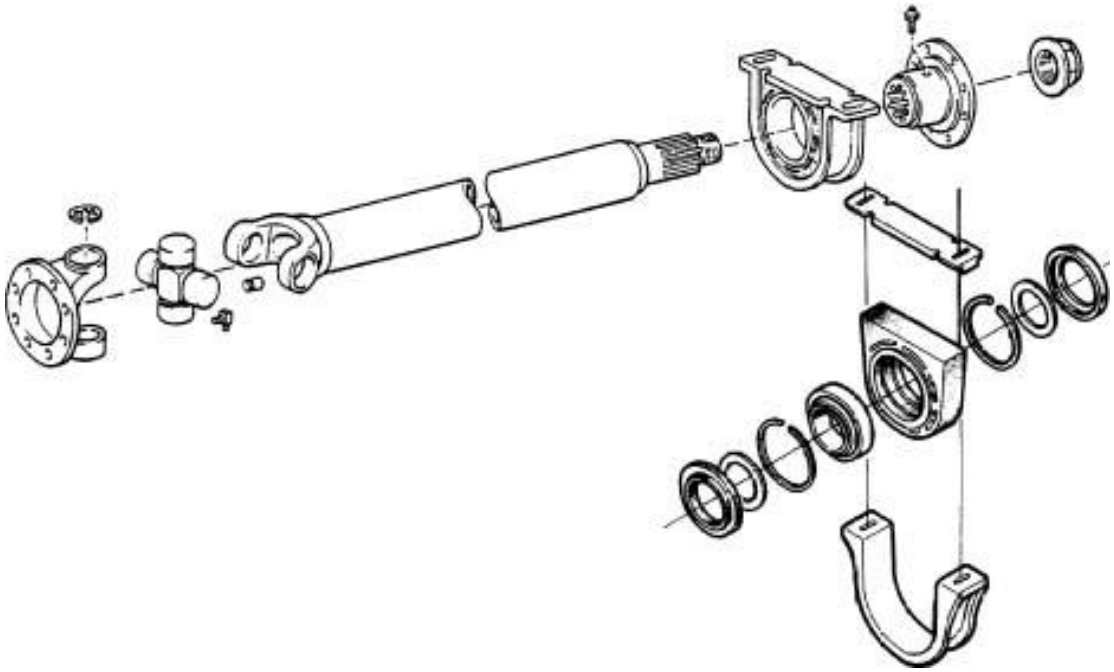

Fig. 6-2 Intermediate propeller shaft

- According to linkage manner, it is also divided into plane disc series and contrate gear series propeller shafts. The contrast of two structures are as shown in Fig. 6-3. Contrate gear propeller shaft has bigger torque delivery capability and reliable operation, and its connecting bolts are reduced to 4 pieces from original 8 pieces. It is more convenient for assembling and increases the linkage reliability.

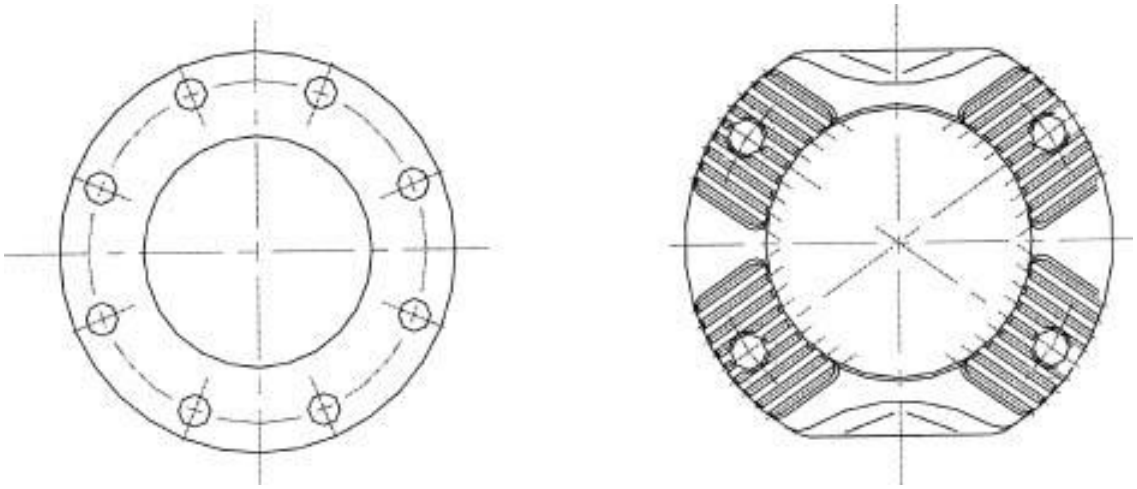

Fig. 6-3

- The cardan universal joint consists of drive and driven forks and cross shaft. In order to reduce the friction losses between drive and driven fork shaft holes and cross shaft journals and to enhance the driving efficiency, rollers are adopted for cardan universal joint instead of needles. And butterfly spring is added at its end to press tightly needles, so as to avoid its tilting, meanwhile the short and thick cross shaft is available to greatly increase the load-bearing capability and service life. It also prevents rollers from being ruptured. In order to reduce the weight of cross shaft, it is made hollow to store lubricating oil to lubricate bearings and there is oilway to shaft journal. Nylon gasket with spiral groove is added at the end of cross shaft to prevent the end surface from being burnt during power delivery with big included angle or high torque.
- The middle and rear axle propeller shafts are made telescopic. The propeller shaft is divided into two sections, which is linked with spline shaft and spline sleeve. The length of spline ensures the propeller shaft neither to be disengaged nor to be blocked in various operation conditions. The previous sliding fork with spline hole is modified to be a sliding fork with spline shaft, and the spline that is traditionally-welded on the axle tube is modified to be spline sleeve. Refer to Fig. 6-4 for its structure.

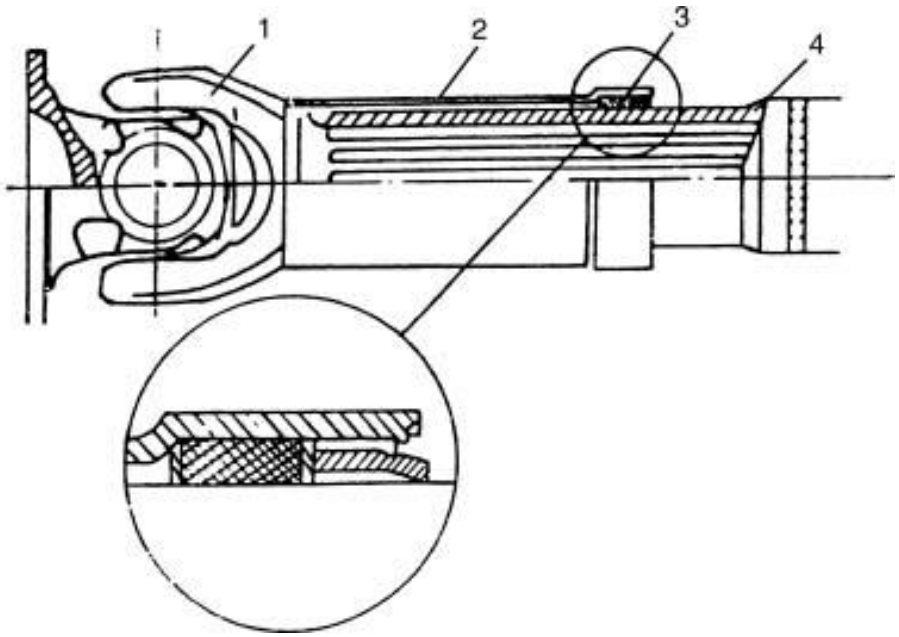

Fig. 6-4 Structure diagram of propeller shaft telescopic joint

1. Sliding fork 2. Seal sleeve 3. Seal ring 4. Spline sleeve

- The traditional telescopic rectangular teeth spline of the system is modified into the short teeth, big pressure angle, involute teeth, tooth root strength is increased, and can be formed by extrusion. The out-of-date processing technology at two sides of hobbing spline and grinding spline is eliminated. It has long service life and adapts to the needs of big torque delivery of HD vehicles.
- In this series of propeller shaft, a protective sleeve is added to the outside of the spline sleeve of telescopic propeller shaft, i.e., polyurethane elastomer and polyurethane foam rubber oil seals are adopted to form a seal space with spline and axle tube, thus it enhances sealing performances and improves the operation conditions of sliding spline and prolongs the service life.
- Because the sealing of telescopic joint is good, during assembling, it is necessary to apply a layer of grease to sliding spline section. There is no grease nipple on the spline sleeve.

- Because the nylon material has very strong wearability and self-lubrication, the inner and outer surfaces for some types of spline sleeves are applied with wear-resistant nylon layer. After being immersed with nylon materials, it can enhance its spline life to10 times. If there is no dust and sand intrusion, the vehicle can keep the wear-resistant layer even after 300,000km running, thus its service life is three times of the propeller shaft in ordinary structure. Besides, it can reduce the axial force by 40% so as to reduce the energy losses of engine. After the outer surface of spline sleeve is immersed with nylon layer, the rust can be prevented to improve sealing performance of oil seal. The intermediate support of intermediate propeller shaft consists of the suppor, bearings, etc. The bearings are fitted inside support and are clamped by the front and rear bearing covers. Rubber gasket ring is fixed between bearing and support. When the bump occurs during vehicle running, the rubber gasket ring may have a slight axial movement and elastic deformation to prevent the ball bearing from being damaged due to overload.

- After the propeller shaft and universal joint are assembled, it is necessary to carry out dynamic balance test. If there is unbalanced phenomena, balance iron sheet should be welded on the corresponding positions of propeller shaft. The marks are carved on the balanced propeller shaft and universal joint sliding fork for the purpose of identification during reassembling after service and maintenance.