ZF (AXIAL SELF SERVO) LIMITED SLIP DIFFERENTIAL

Description

The ZF limited slip differential is a self activating curved track geared unit which retards differential rotation by friction brakes. In place of pinions and side gears a driver plate runs between two curved track elements. The sliding studs of the driver plate exert high axial force on the curved tracks when transmitting power. The hemispherical ends of the sliding studs effect a high pressure angle on the curved tracks thereby pressing them against the differential carrier. This pressure supplies the braking force which prevents differential movement of the two curved tracks. The difference in the number of curves on the two tracks allows the two elements to rotate in opposite directions as a customary differential gear. One track has eight and the other nine curves.

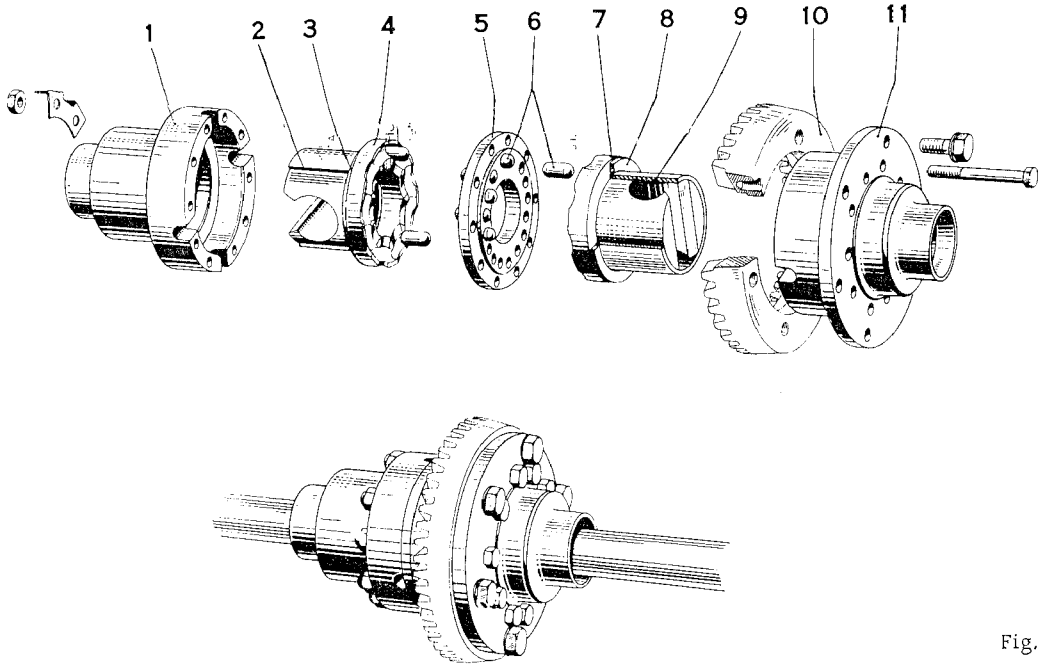
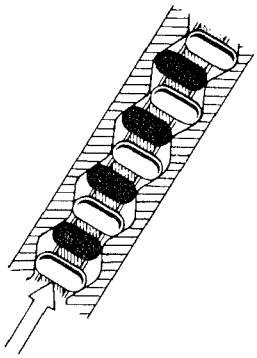


Fig. 7

1. Carrier half without flange
2. Axle joint body
3. Brake ring
4. Curved track element
5. Driver plate
6. Slidingstud
7. Curved track element
8. Brake ring
9. Axle joint body
10. Ring gear
11. Carrier half with flange

The torque from the ring gear is transmitted through the differential carrier, which is composed of two halves and the driver plate, to the sliding studs running in the curved tracks. Since the curved tracks have a different number of curves they do not have parallel surfaces. For this reason the sliding studs are prevented from advancing past the curved tracks effecting rotation of the axle shafts together with the driver plate. Under full load the differential becomes practically locked through the high axial force on the brake rings while under light loads such as when negotiating certain portions of a sharp curve the wheels are free to rotate differentially. Driving under half power through curves such as in city driving, places very high demands on the curved tracks and brake rings and is not recommended.

Section view of a linear development of the curved tracks, driver plate and sliding studs



The black studs transmit power when force is in direction shown

Fig. 8

Characteristics

1. Permits differential rotation of the wheels in curves.
2. Transmits equal rotation to both wheels under power.
3. Prevents independent wheel spin in the event of poor traction.
4. Independent wheel spin occurs only when one wheel has no traction or is off the ground for a greater time whereby the force necessary for the differential brake ceases. Short periods of poor traction such as intermittent wheel lift are spanned by the unit before the braking effect has time to dissipate since the inertia of the free wheel is sufficient to activate the brake.

ZF LIMITED SLIP DIFFERENTIAL

Removal and installation

The ZF limited slip differential is removed and installed in the same manner as described in section Rear axle item 8 RA of the 356B Shop Manual.

Disassembly

1. Free safety taps of through bolts.
2. Remove through bolts and open the differential carrier.
3. Clean all parts in cleaning solvent.

Assembly

1. Inspect cleaned parts for wear and material failures. The sliding studs must not vary in length more than 0, 05 mm (. 002 in).
2. Apply molykote G paste lubricant to the curved tracks and sliding studs. Parts must first be free of oil.
3. Insert sliding studs in the driver plate.
4. Install brake rings on the axle joint bodies and place in differential carrier. Assemble carrier halves to driver plate fasten through bolts.
5. Measure the total axial play of the axle joint bodies within the carrier halves. Permissible play 0, 2 to max. 0, 3 mm (. 008 to . 012 in). If play is excessive use thicker brake rings to obtain the correct play.
6. With the correct axial play the differential gear must turn freely by hand.
7. When the differential is completely assembled check rotational play by holding one axle joint body fixed with the carrier housing and rotating the opposite joint. Free travel observed through the carrier housing openings should be from 1 to 1, 2 mm (. 040 to . 047 in) measured on the outer circumference of the curved track.
8. Tighten the nuts of the connecting screws with a tension wrench to Md = 2, 3 - 2, 5 mkg (ft lb = 16, 6 - 18) and secure with securing strip.

Note:

Through wear of the curved track the rotational play can become as great as 3 to 4 mm without affecting the function of the differential. However, such play will cause noises during power reversal which have no effect on the functioning of the unit.

Gear Lubricant:

The proper lubricant is SAE 90 Hypoid Gear Lubricant.

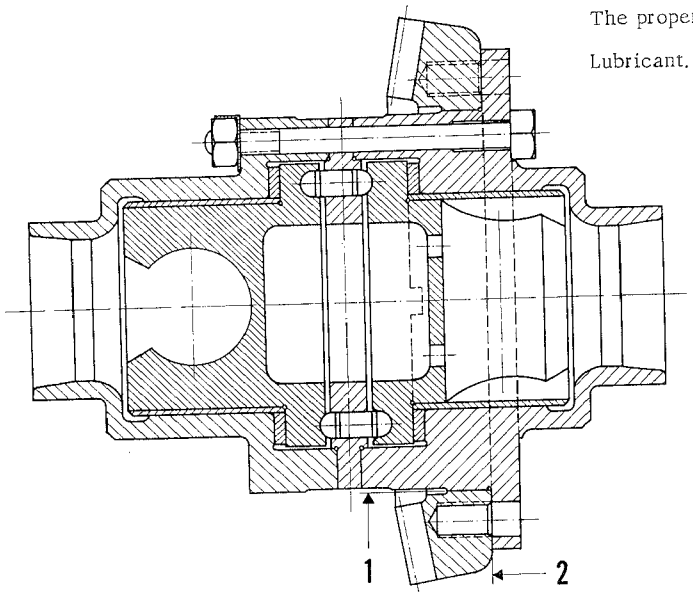


Fig. 9

1. Eccentricitiy max. 0, 05 mm (. 002 in)
2. Wobble max. 0, 003 mm (. 0012 in)