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HOWO ZZ4257S3241V

CHAPTER 3 CLUTCH





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- Clutches are structured in two types: one is a single-plate, dry, circumferentially arranged spring-loaded clutch. Its driven disk is fit with spring torsional vibration damper. The driven disk is 380mm and 420mm in outside diameter. The clutch is typed GF380 and GF420. 380mm clutches are used for 200 hp engines, 420mm clutches for 240~290 hp engines, and 420mm reinforced clutches for 310~336 hp engines. Clutch with pressure plate spring is of reinforced type. The other type is diaphragm spring clutch. Its driven disk is 430mm in outside diameter. This type of clutches is used for 371 hp and 420 hp engines. The clutches used on STEYR, HUANGHE-PRINCE and HOWO series heavy-duty (HD) trucks are operated by air-assisted and hydraulically operated control mechanism. STEYR trucks can also use air-assisted and mechanically operated control mechanism.





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- The clutch is located at the rear end of the engine crankshaft. Its basic functions are:
 - 1. To engage the engine and the driveline properly, so as to guarantee that the vehicle may begin to move smoothly.
 - 2. To temporarily cut off the power linkage between the engine and the driveline, so as to ensure a smooth gearshift.
 - 3. To utilize the sliding friction between the driving and driven parts of the clutch to limit the maximum transmission torque, so as to prevent the driveline from being overloaded.





SECTION 1 SPRING-LOADED CLUTCH

I . Basic performance parameters

Table 3-1 Basic performance parameters



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Type	GF380 HOWO ZZ4257S3241V	GF420
Driven disk OD (mm)	380	420
Max. transmission torque (Nm)	700	1,400
Number of driven disks	1	1
Number of pressure plate springs	36	36
Clamping load of pressure plate (N)	14,800~16,540	17,740~19,780 Reinforced-type 21,420~23,860
Release force (N)	3,630	4,320 or 5,210
Total thickness of driven disks (mm)	10±0.3	10±0.3
Thickness of single friction disk (mm)	3.5	3.5
Total thickness of release ring (mm)	7	9
Clutch casing	SAE2	SAE1



II. Structural features and operating principle

- The clutch is in traditional single driven disk structure with dry and circumferentially arranged coil springs. It is composed of driving part, driven part, clamping mechanism and release mechanism, as shown in Fig. 3-1.
- The driving part and the clamping mechanism consist of clutch cover, pressure plate spring, etc. The clutch cover is made of gray cast iron. There are 6 notches on its flange for the purpose of ventilation. The pressure plate spring is of cylindrical coil type. The springs are divided into 3 groups depending on their rigidity. The spring with max. rigidity is in green color, with medium rigidity is in red, and with smallest rigidity is colorless. All pressure plate springs are distributed evenly around the pressure plate. Different clamping loads can be realized by varying the number and position of the three different types of springs so as to meet the need of different types of vehicles. For positions of the three groups of springs, see Fig. 3-2.



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- There are 36 bosses behind the pressure plate for mounting springs. In order to make sure that the spring force of these springs is not reduced following high temperature tempering, there are flower-shaped protrusions on these bosses, allowing the springs to be supported on the pressure plate with a very small contacting surface.
- The driven part is a driven disk assy. with a torsional vibration damper, consisting of driven disk steel sheet assembly, friction disk, intermediate spring leaf, etc. Friction disks are provided in two dimensions: $420 \times 220 \times 3.5$ (mm) and $380 \times 220 \times 3.5$ (mm). There is a corrugated spring leaf located between the friction disk and the driving disk used as a buffer, making the engagement of the clutch gently. The stiffness of the corrugated spring leaf is comparatively great. So, it is suitable for use on HD trucks. Torsional vibration damper of the driven disk includes the pre-damper and the main damper. The force of the pre-damper spring is rather weak. It is mainly used to minimize the torsional vibration of the engine at idle speed prior the main damper begins to work. The driven disk hub is divided into inner and outer hubs. The pre-damper is installed between the inner and the outer hubs, and the main damper is installed between the outer hub and the steel plate. The main damper consists of the tangentially configured coil springs and the antifriction unit.





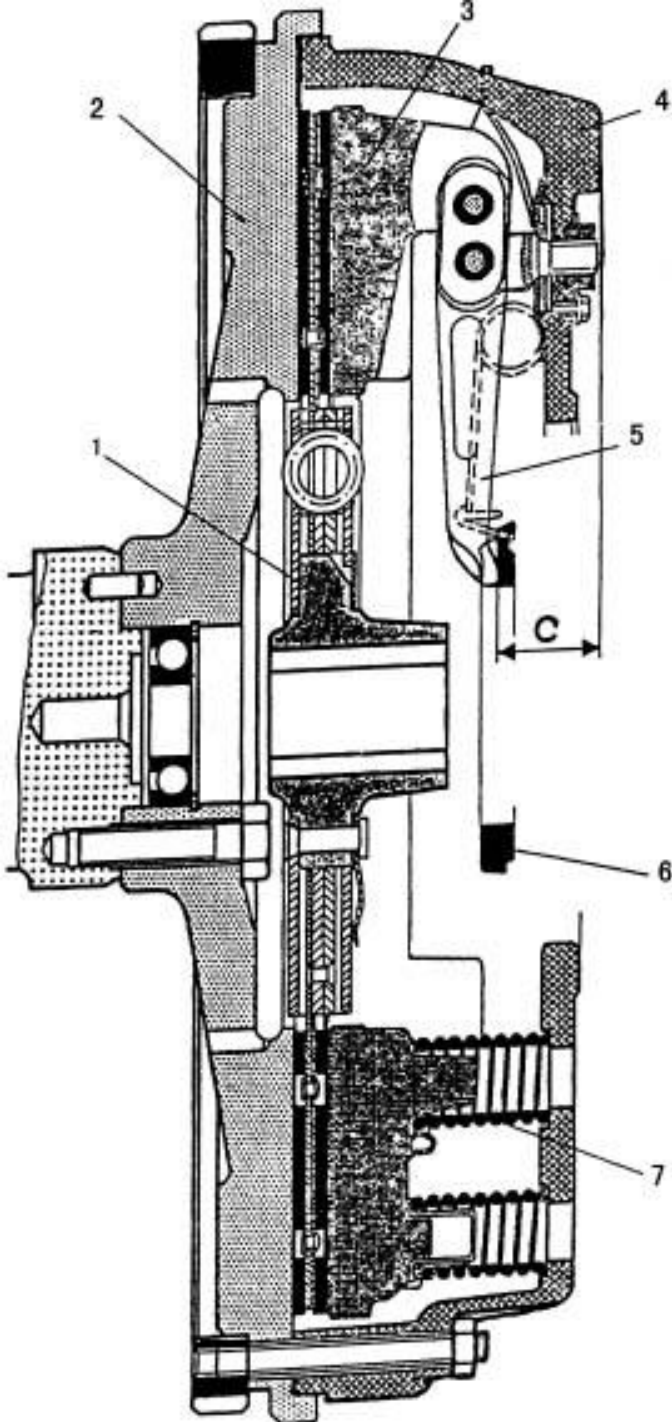
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- The release mechanism is composed of the release lever, release lever fork, release ring, release sleeve, release bearing, clutch fork shaft, etc. The release lever is die forged and carburized/quenched. The bearing shaft linked with the clutch cover adopts a bimetal composite bushing. The release lever is linked with the release lever fork and the pressure plate by means of shaft pin and needle roller. The spring pressure plate and the torsion spring on the inner side of the release lever fork and the clutch cover are capable of keeping the release lever and its bracket stable when the clutch is engaged. During the process of the clutch disengaging, the release lever swings around the shaft pin on the bracket. The outer end of the lever may drive the pressure plate to move horizontally.

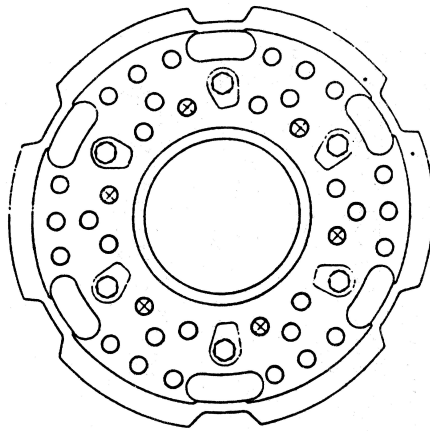
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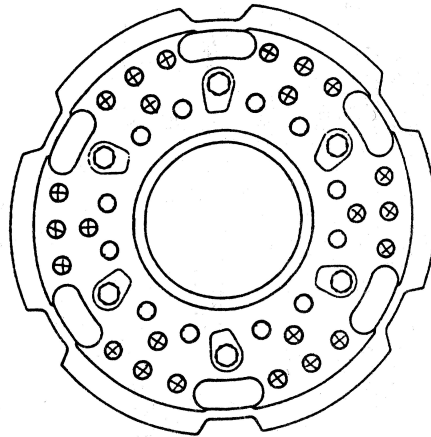


1. Driven disk assy.
2. Flywheel
3. Pressure plate
4. Clutch casing
5. Release lever
6. Release ring
7. Pressure plate spring

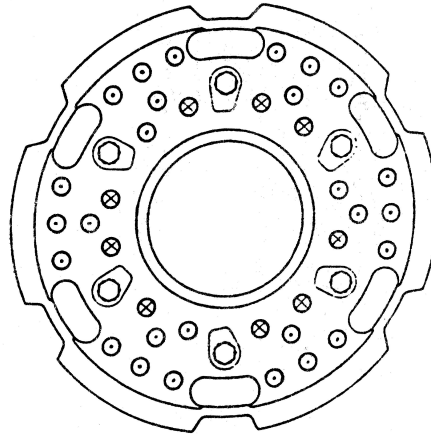
Fig. 3-1 The structure of the clutch



200马力
GF380



260, 280 马力
GF420

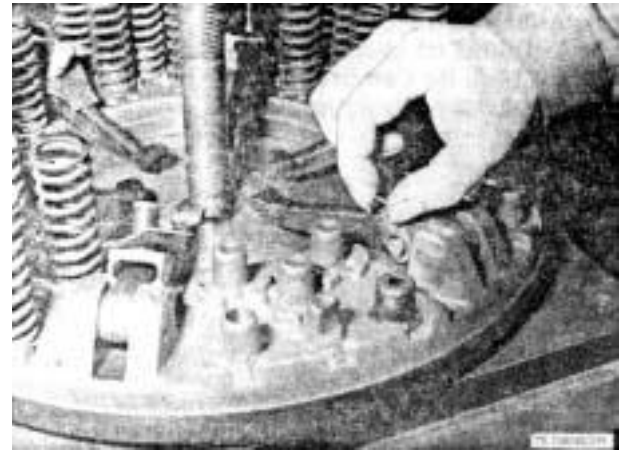
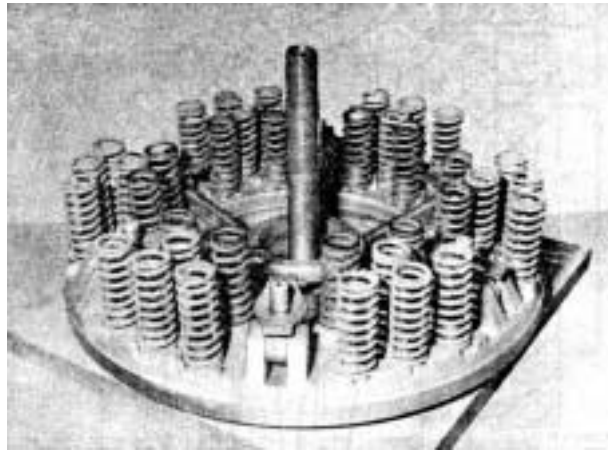


310 马力
GF420X

- = 无色
- ⊗ = 红色
- ⊙ = 绿色



III. Assembly and disassembly of the clutch



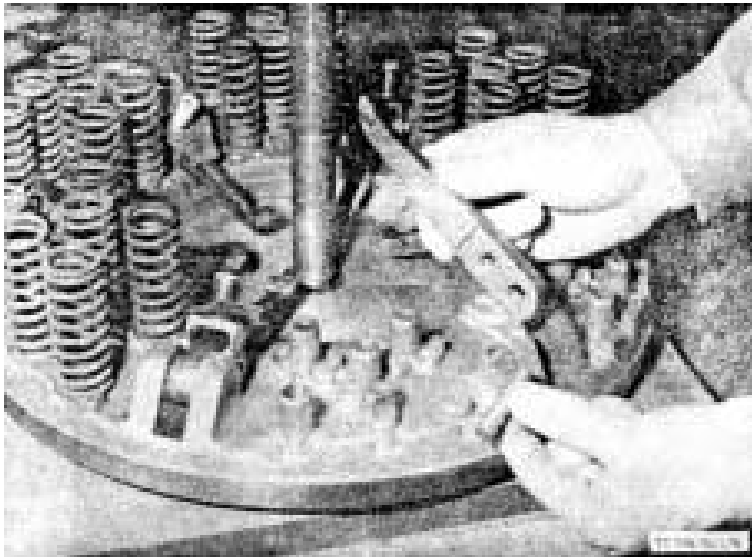
- 1) The disassembled clutch springs and heat insulating gasket should be placed on the clutch pressure plate as per requirement of the specific engine (Springs for different types of engines differ in spring force and are differentiated by different colors, and fitting position marks should be made for the springs during disassembly.)



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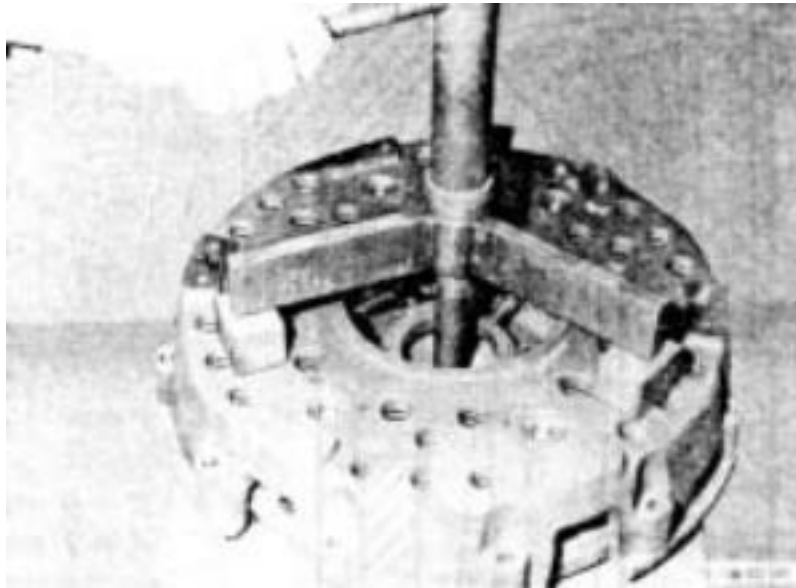
- 2) Install the six release lever pressing pawls and the pressure shaft pin.





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- 3) Use a special tool and press fit the clutch cover and the pressure plate. Make sure to insert the pressing pawl adjusting screw through the hole in pressure plate casing, and that the clutch spring is aligned with the spring holder hole.

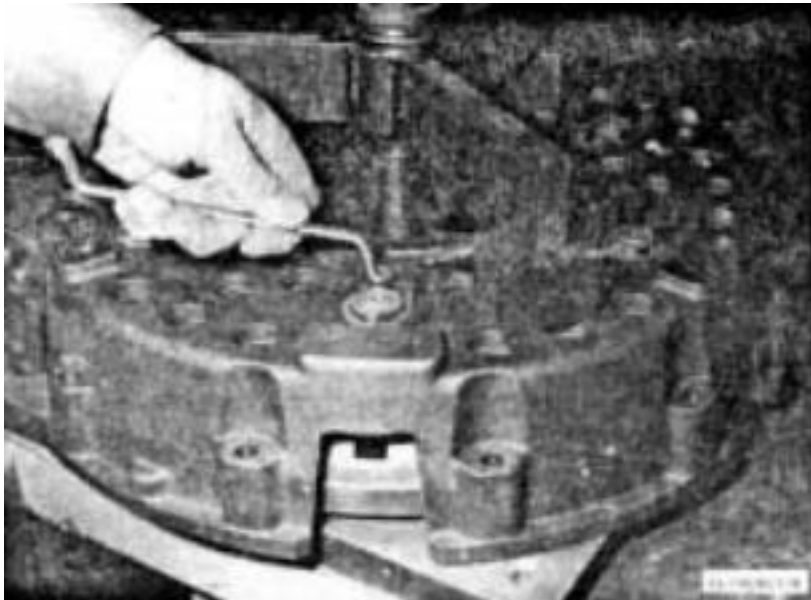




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- 4) Install the six pressing pawl adjusting nuts, and adjust the six pressing pawls in the same height. And then install them into the release ring and secure them by means of fixing springs. Remove the special tool.

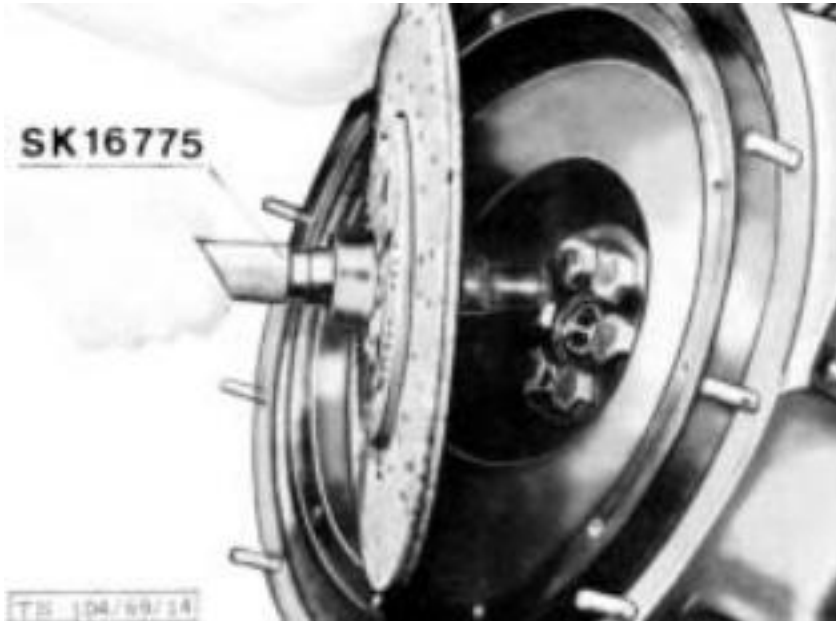




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- 5) Turn a special shaft similar to the input shaft of the transmission. The diameter of the shaft should be the same as the bearing bore of the flywheel bore and the journal of its other part the same as the inside diameter of the spline hole of the friction disk (the clutch driven disk). This tool is called the centering bar of the clutch.





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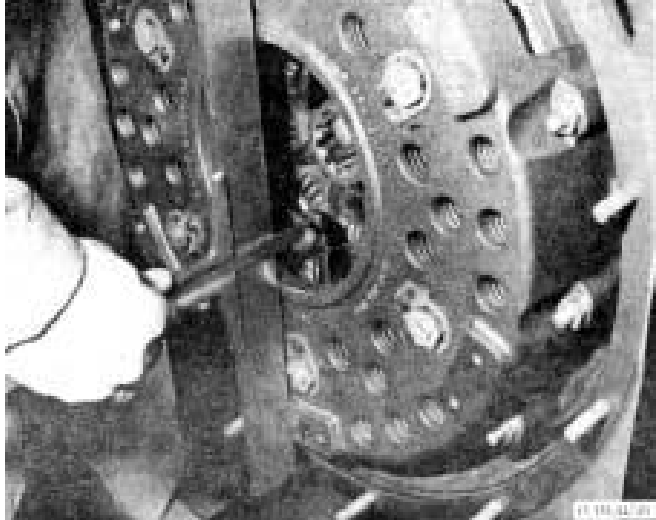
- 6) Use this centering bar to assemble the clutch driven disk and the pressure plate and insert the end of this bar into the bearing bore of the flywheel, so as to locate the driven disk and the pressure plate properly.
- Using fixing bolts, join and tighten the pressure plate assy. to the flywheel to 65Nm.





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- 7) Pull out the clutch centering bar.
 - When fitting a new driven disk, check must be made to ensure that its thickness is less $10\pm 0.3\text{mm}$, or the clutch might not be able to disengage completely.
 - Position a leveling rule on the surface of the measuring boss of the clutch pressure plate, and use a depth gage to measure the height "C" of the pressing pawl up to this surface. Adjust "C" to the specified value. (See the Figure).
-
- There are the procedures of assembly of the clutch above.
 - And the procedures of disassembly of the clutch are in opposite sequence of the assembly.



IV. Maintenance features and assembly and adjustment

- **1) Precautions for disassembly**
- Before disassembling the clutch, a fitting mark should be made between the clutch cover and the flywheel. Remove the fastening bolts of the clutch cover and the flywheel, and take off clutch assy. and the driven disk assy.
- Remove the three snap springs fixing the release ring, and take of the release ring. Make marks on the clutch cover and the pressure plate.
- Loosen the fixing screw of the lock tab of the adjusting nut, and remove and keep the lock tab.
- Put the clutch assy. on a special disassembly tool or a press machine, tighten the special tool to hold down the clutch cover, take off the adjusting nut of the release lever, loose the special tool and remove the clutch cover.
- Record the number and position of various springs in different colors, remove the pressure plate spring and spring seat, drive out the release lever shaft pin, and disassemble other release levers in the same method.



2) Inspection and repair of main parts

The release bearing should be able to rotate freely without noise and jamming. Before assembly, fill the bearing and the oil pipe with grease.

The pressure plate spring should be free from cracks and warping, or it should be replaced. Springs of different colors should comply with the following

requirements:

Spring color		Green	Red	Colorless
OD (mm)		29.2	29.2	29.2
Spring wire Dia. (mm)		4.3	4.0	3.75
Free length (mm)		67	74±2	75±2
Spring force when the spring is compressed to 45mm	(Nm)	667±30	569±30	466±25
	(kg)	67±3	58±3	47±2.5



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- The depth of the groove on the friction surface of the pressure plate must not exceed 0.5mm, and the warping of the pressure plate must not exceed 0.4mm, or the pressure plate should be lap repaired. The max. lapping amount should not exceed 1.0mm. When the lapping amount is greater than 0.5mm, a shim of appropriate thickness should be placed between the pressure plate spring and the spring seat.
- There should be no obvious clearance between the release lever pin hole and the shaft pin.
- The friction disk of the driven disk can be reused after thorough cleaning by means of gasoline or boiling in alkaline water in case of being stained with oil or grease, or proper filing and grinding in case of being slightly burnt and becoming hardened. If the friction disk is smaller than the rivet head by less than 0.5mm in depth, or seriously burnt or cracked, then the driven disk must be replaced.





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- 3) Assembly and adjustment
- Coat the shaft pin, pin hole bushing and other friction surfaces with grease, and assemble them in the sequence mentioned above.
- Assemble the clutch cover and the pressure plate in accordance with their fitting marks. Position them on the special tool or press machine, properly seat the pressure plate spring, and place the springs of different color to their respective positions. Tighten the special tool, press down the clutch cover, and alternatively and evenly tighten the adjusting nuts of various release levers. Loosen the special tool, and remove the clutch assy.





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- Adjust the height of the release lever.
- Make a round measuring disk with its outside diameter same as that of the driven disk and in a thickness of 10 ± 0.01 mm. Set this measuring disk on the special disassembly tool of the clutch, and then put on the clutch assy. and the three-prong pressure plate. Tighten the special tool, making the measuring disk flush with the front end surface of the clutch (i.e. flywheel mating surface). Use the depth gage and measure the distance A from the arc surface of the release lever to the measuring disk, as shown in Fig. 3-6.
- Distance A is given in Table 3-3. Distance A can be adjusted by rotating the release lever adjusting nut if it is unsatisfactory. The height difference of the six release levers must be less than 0.4mm. Upon the completion of adjustment, fit the lock tab of the adjusting nut, and tighten the lock screw.
- If there is no measuring disk shown in the Figure, the release lever height can also be adjusted after the clutch is mounted on the flywheel. The method is as follows: Install the clutch on the flywheel, place a straight rule on the locating plane surface of the rear end of the clutch cover, and use a depth gage to measure the distance C from the arc surface of the release lever to the locating plane surface of the clutch end. Value C is given in Table 3-3. Turning the adjusting nut can vary value C.

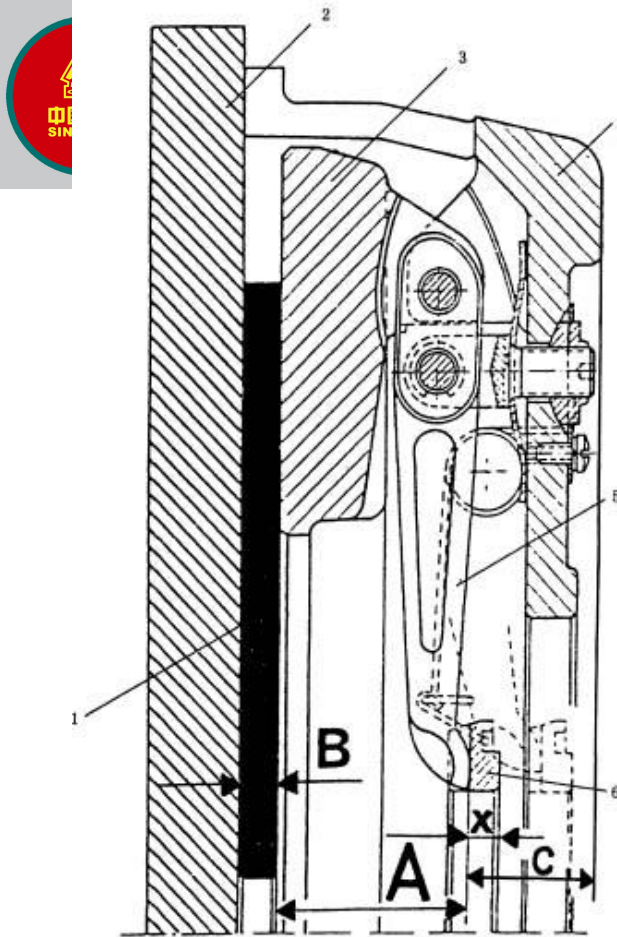




Table 3-3

Type of clutch	GF380	GF420
A	53	56
B	10±0.01	10±0.01
C	27	36
C*	17	19
X	7	9

- Note: ① Values in the Table are in mm; ② X in the Table is the thickness of the release ring.



1. Measuring disk 2. Flywheel 3. Pressure plate 4. Clutch casing 5. Release lever 6. Release ring

Fig. 3-3 Adjustment of the height of the release lever



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- As the friction disk is subjected to wear in operation and would gradually become thinner, the inner end of the release lever is raised, thus reducing value C . When value C is reduced to beyond the minimum limit C^* , the friction disk must be replaced.
- Attention should be paid to the following points during assembly:
- When fitting the driven disk, its long hub side must face rearward.
- Before installing the pressure plate, a centering bar must be inserted through the spline hole of the driven disk and into the front bearing of the flywheel speed governor. Remove the centering bar only after the fixing screws are tightened.
- Fitting marks should be aligned when installing the pressure plate on to the flywheel.





SECTION 2 DIAPHRAGM SPRING CLUTCH

I .Basic performance parameters

Table 3-4

Type	GMFZ430
Driven disk OD (mm)	430
Max. transmission torque (Nm)	1,800
Clamping load of pressure plate(N)	30000~31500
Release force(N)	8400
Number of driven disks	1
Clutch casing	SAE1