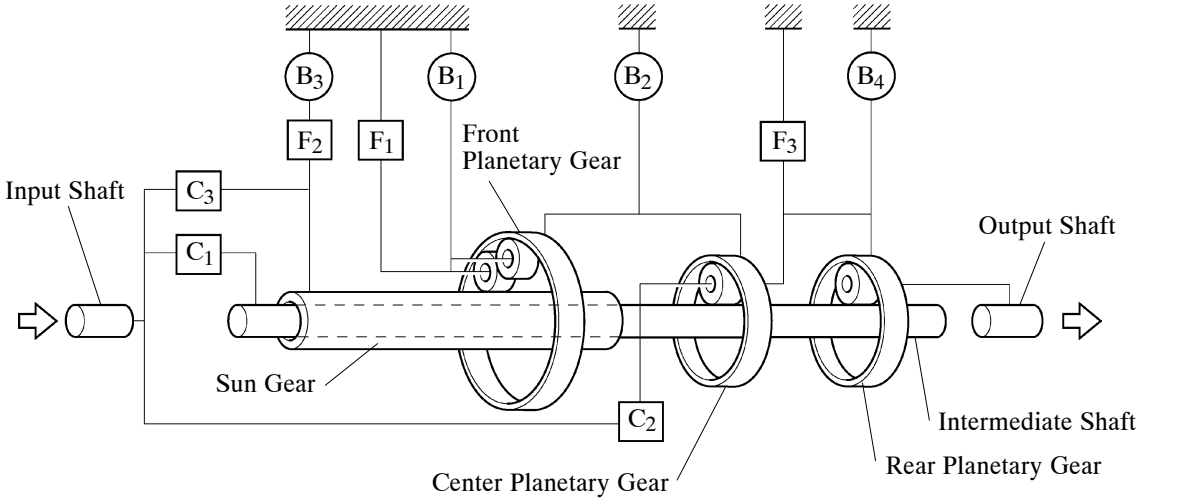
■ PLANETARY GEAR UNIT

1. Construction

- A 5-speed configuration has been achieved using 3 (front, center, and rear) planetary gears, thus creating a 5-speed automatic transmission.
- A front planetary carrier made of aluminum is used to reduce the weight.
- A centrifugal fluid pressure canceling mechanism is used in the C_1, C_2, and C_3 clutches that are applied when shifting from 2nd to 3rd, from 3rd to 4th and from 4th to 5th. For details, see page CH-45.



229LC160

2. Function of Components

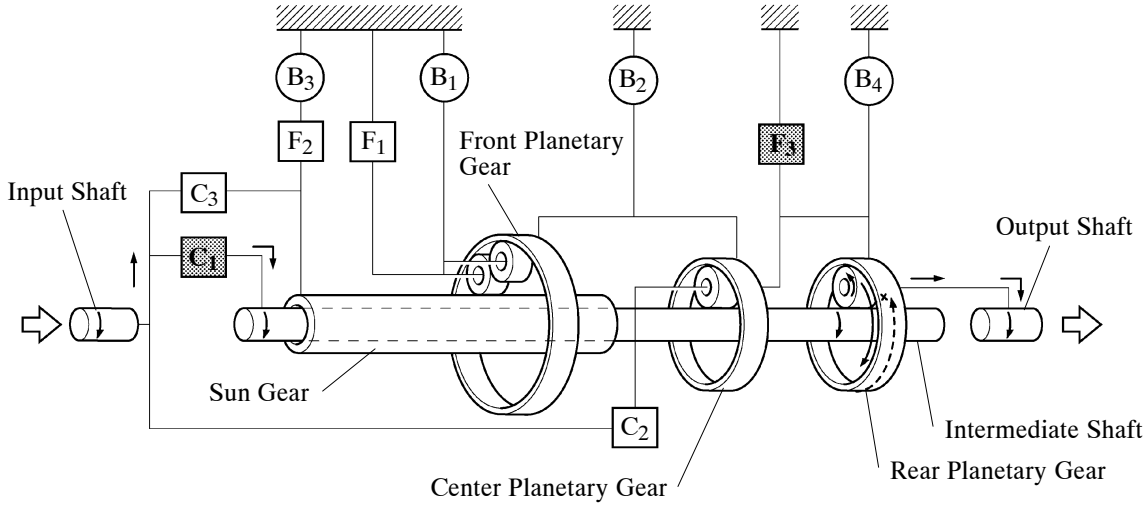
Component		Function
C_1	No. 1 Clutch	Connects input shaft and intermediate shaft.
C_2	No. 2 Clutch	Connects input shaft and center planetary carrier.
C_3	No. 3 Clutch	Connects input shaft and front sun gear.
B_1	No. 1 Brake	Prevents front planetary carrier from turning either clockwise or counterclockwise.
B_2	No. 2 Brake	Prevents front and center ring gear from turning either clockwise or counterclockwise.
B_3	No. 3 Brake	Prevents outer race of F_2 from turning either clockwise or counterclockwise.
B_4	No. 4 Brake	Prevents rear ring gear from turning either clockwise or counterclockwise.
F_1	No. 1 One-way Clutch	Prevents front planetary carrier from turning counterclockwise.
F_2	No. 2 One-way Clutch	When B_3 is operating, prevents planetary sun gear from turning counterclockwise.
F_3	No. 3 One-way Clutch	Prevents center planetary carrier and rear ring gear from turning counterclockwise.
Planetary Gears		These gears change the route through which driving force is transmitted, in accordance with the operation of each clutch and brake, in order to increase or reduce the input and output speed.

3. Transmission Power Flow

Shift Lever Position		Solenoid Valve						Clutch			Brake				One-way Clutch		
		S1	S2	SR	SL1	SL2	SLU	C_1	C_2	C_3	B_1	B_2	B_3	B_4	F_1	F_2	F_3
P		ON				ON											
R*		ON				ON				○	(○)			○	○		
N		ON				ON											
D	1st	ON				ON		○									○
	2nd	ON	ON			ON		○					○		○	○	
	3rd		ON			ON		○		○			●		○		
	4th					ON		○	○	●			●				
	5th			ON	ON		ON		○	○	○		●				
4	1st	ON				ON		○									○
	2nd	ON	ON			ON		○					○		○	○	
	3rd		ON			ON		○		○			●		○		
	4th					ON	ON	○	○	●			●				
3	1st	ON				ON		○									○
	2nd	ON	ON			ON		○					○		○	○	
	3rd*		ON					○		○	(○)		●		○		
2	1st	ON				ON		○									○
	2nd*	ON	ON	ON				○				(○)	○		○	○	
L	1st*	ON						○						(○)			○

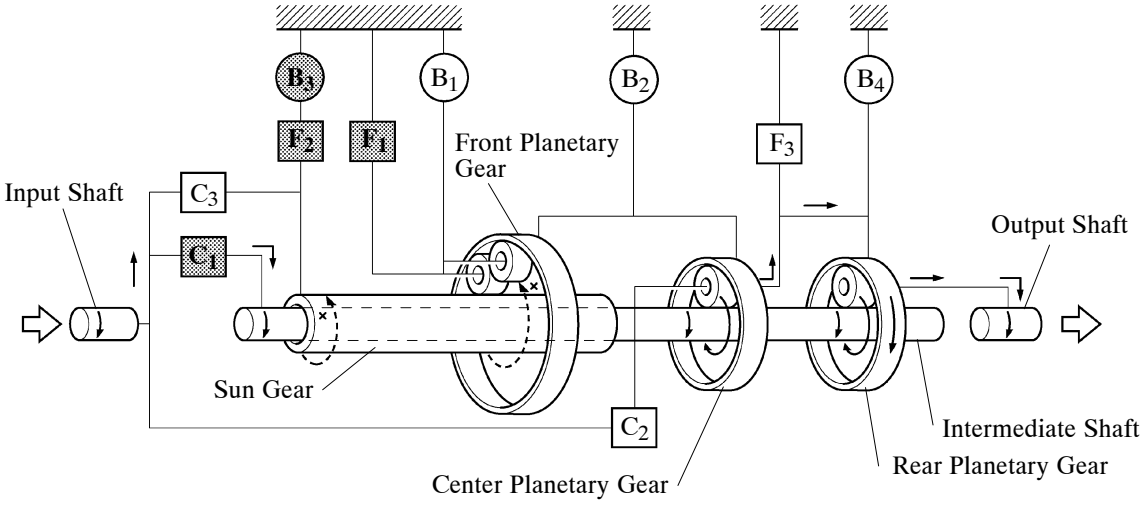
○: Operation
(○): Operation during engine braking
●: Operates but is not related to power transmission
*: with engine brake

1st Gear (D, 4, 3 and 2 Position)



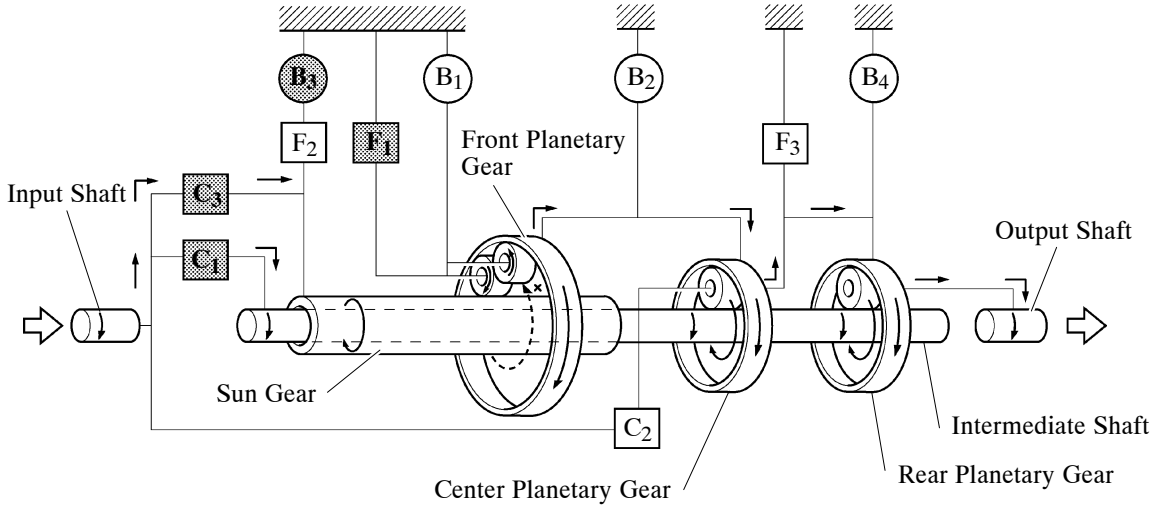
229LC174

2nd Gear (D, 4 and 3 Position)



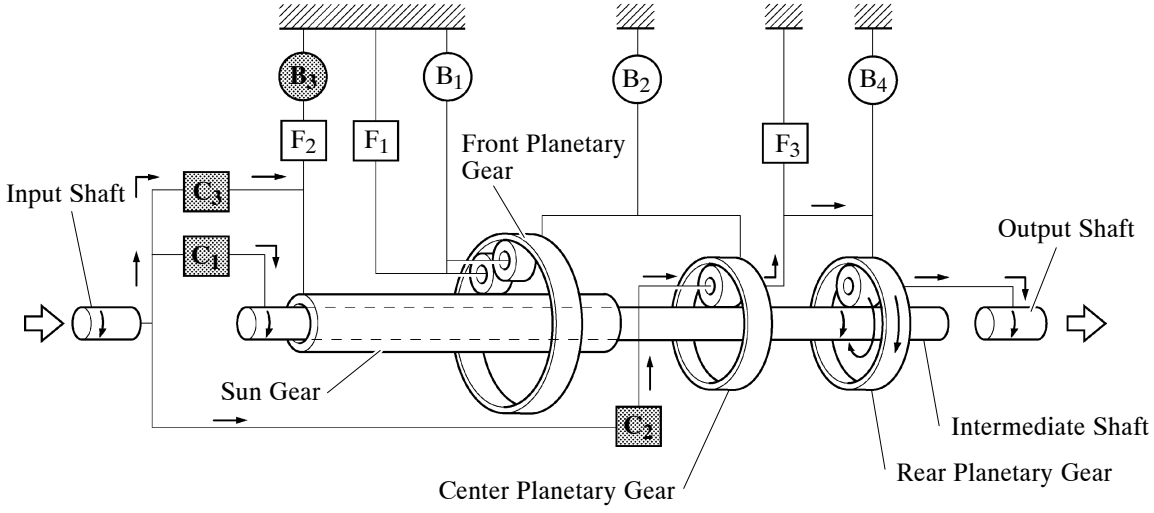
232CH157

3rd Gear (D and 4 Position)



229LC176

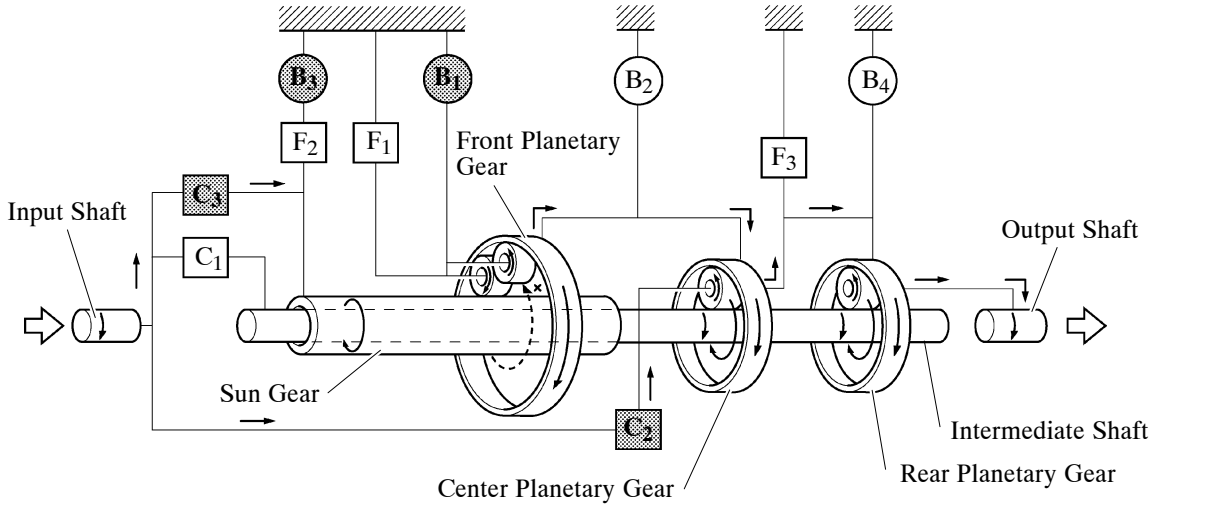
4th Gear (D and 4 Position)



229LC177

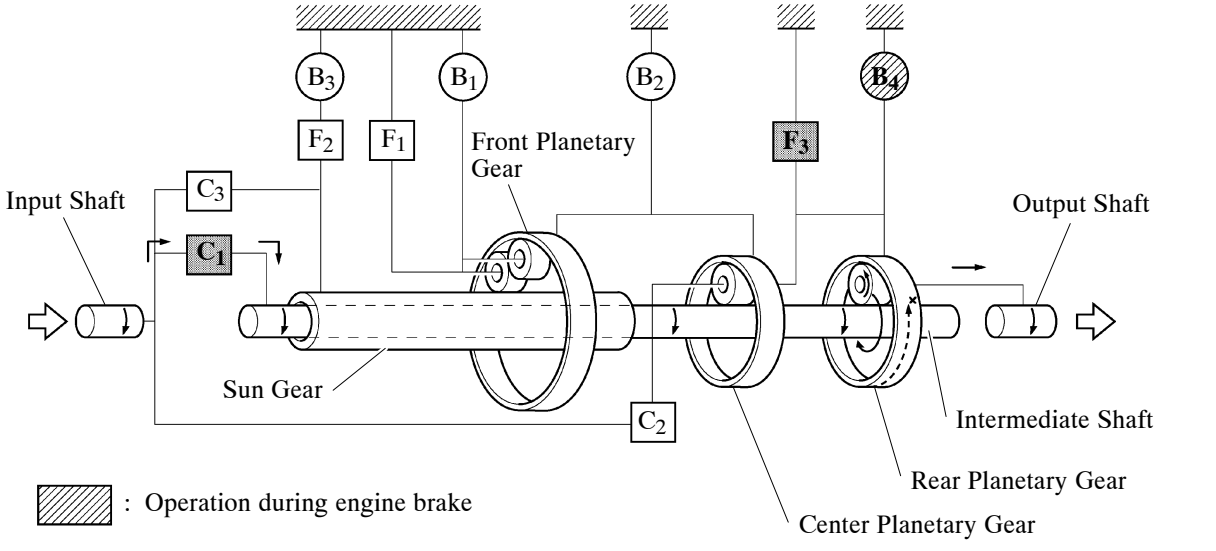
CH

5th Gear (D Position)



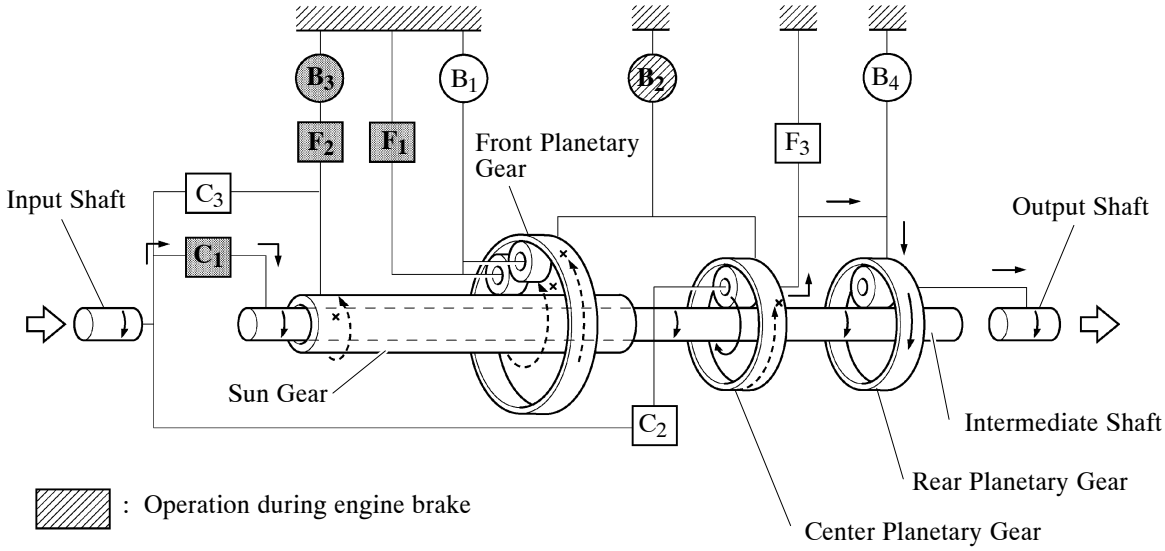
229LC178

1st Gear (L Position)



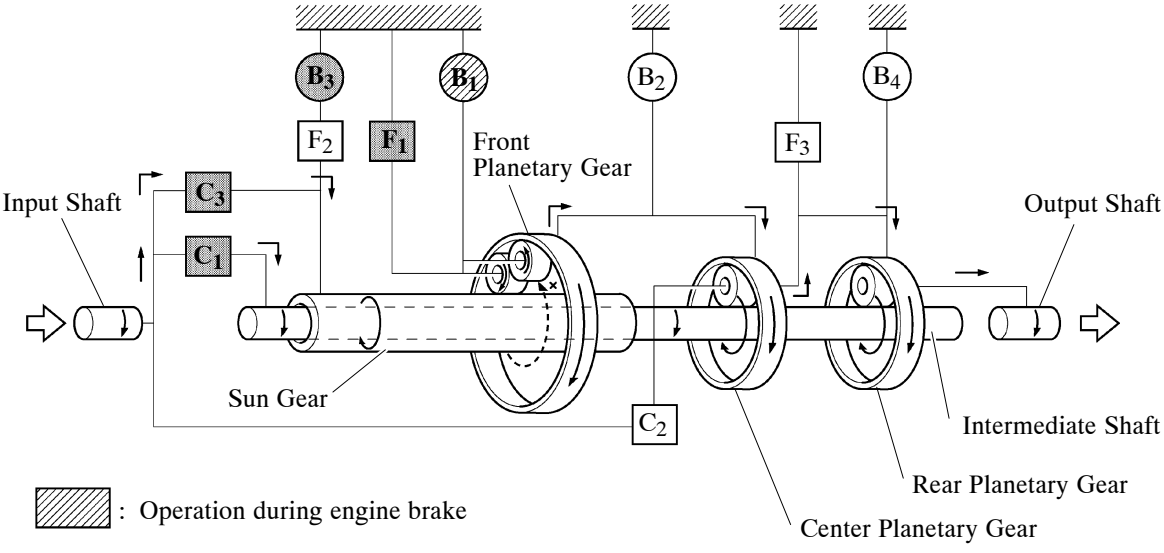
0240CH68C

2nd Gear (2 Position)



0240CH69C

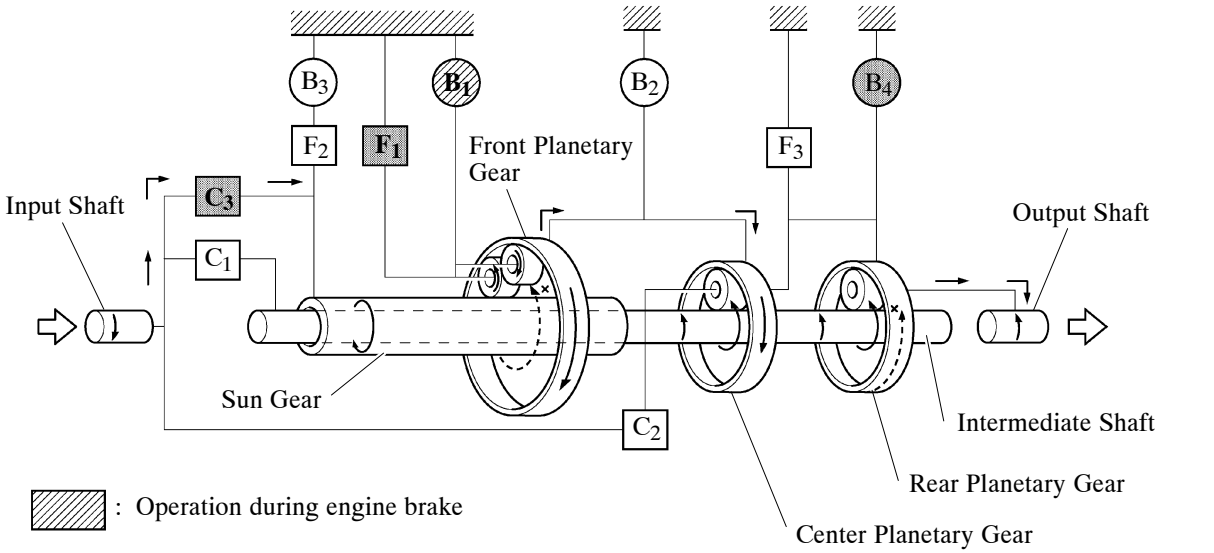
3rd Gear (3 Position)



0240CH70C

CH

Reverse Gear (R Position)



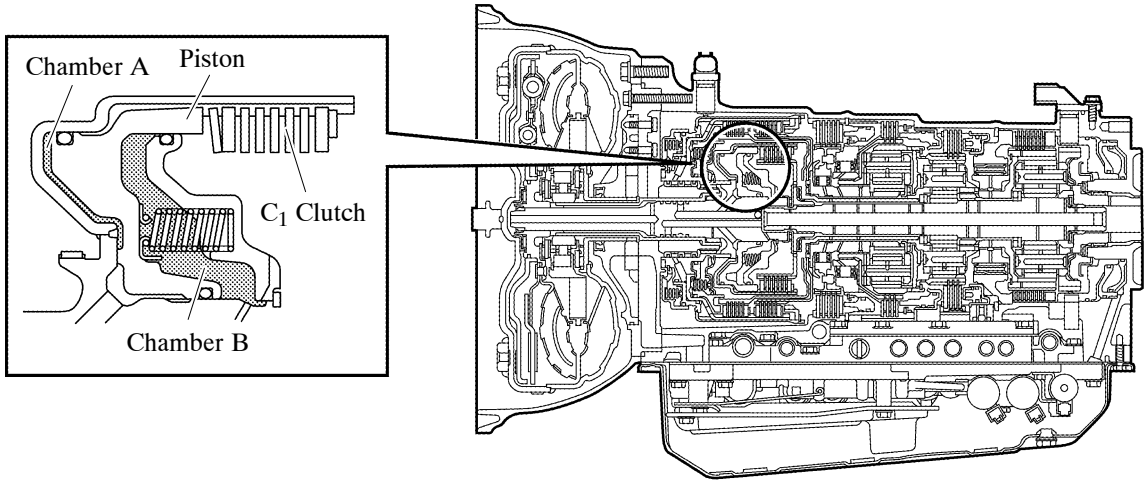
0240CH71C

4. Centrifugal Fluid Pressure Canceling Mechanism

There are two reasons for improving the conventional clutch mechanism:

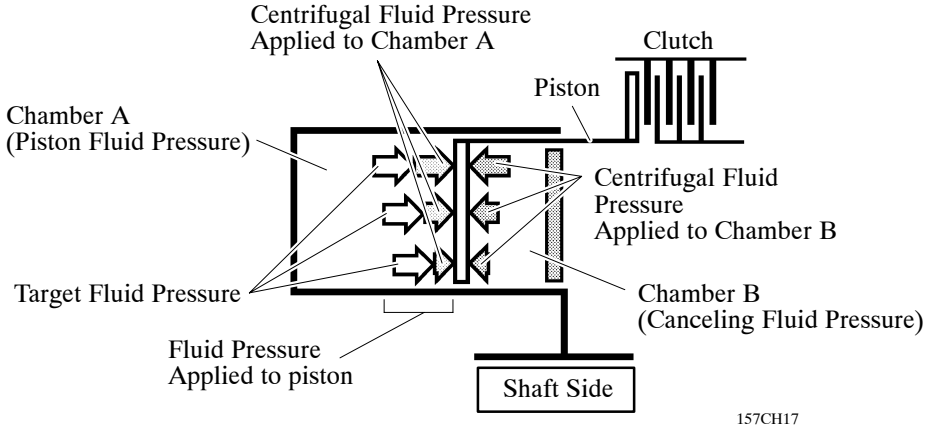
- A check ball is provided in order to prevent the generation of pressure applied by centrifugal force to the fluid in the piston fluid pressure chamber (hereafter referred to as "chamber A") when the clutch is released. Therefore, it takes an amount of time to fill chamber A before the clutch can be applied.
- During shifting, in addition to the original clutch pressure that is controlled by the valve body, centrifugal pressure acts on the fluid in chamber A exerting increased pressure depending upon revolution fluctuations.

To address these two needs for improvement, a canceling fluid pressure chamber (hereafter referred to as "chamber B") has been provided opposite chamber A.



271CH40

By utilizing lubrication fluid such as that of the shaft, the same amount of centrifugal force is applied, thus canceling the centrifugal force that is applied to the piston itself. Accordingly, it is not necessary to discharge the fluid through the use of a check ball, and a highly responsive and smooth shifting characteristic has been achieved.



157CH17

Fluid Pressure applied to piston	—	Centrifugal fluid pressure applied to chamber B	=	Target fluid pressure (original clutch pressure)

091CH003Y