VOLVO
Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Drivetrain, description	**400**	**Service Information**	**2014/7/18**
Profile: **ART, A25E 4x4 [GB]**			

Drivetrain, description

The flywheel housing and power take-off for driving the hydraulic pumps are built as a single unit. Lubrication takes place via the engine lubrication system and oil is returned to the engine by way of a built-in oil pump.

A flex plate located in the flywheel housing drives the torque converter in the transmission.

The transmission is of planetary type and fully automatic with six forward and two reverse gears, all with lock-up. Automatic shifting is controlled by an electronic control unit (T-ECU) which, via the transmission control system, always selects the correct gear for the speed of the vehicle. The transmission also incorporates a retarder.

The dropbox has a differential with locking function.

The ground dependent hydraulic pump for the secondary steering system is also located on the dropbox.

The dropbox is driven by the transmission via a propeller shaft and in turn drives the front and rear drive axles via propeller shafts.

The drive axles have differentials with differential locks and are equipped with the planetary gears in the hubs, so-called hub reductions.

Six-wheel drive can be engaged and disengaged while the vehicle is in motion and is operated together with the longitudinal differential.

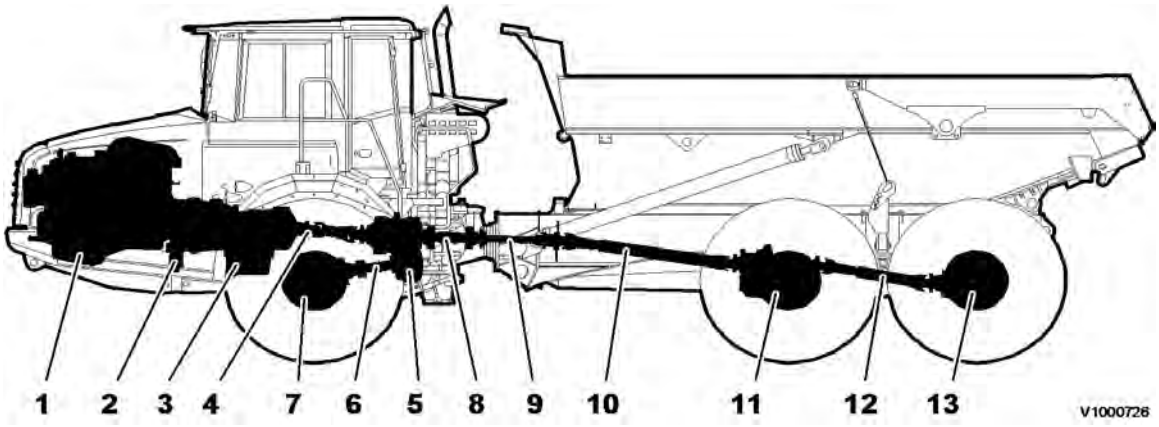

Figure 1
Power transmission

1. Engine D9
    - **A25E EU: D9BABE3**
    - **A25E US + EU: D9BAAE3**
    - **A30E EU: EU: D9BACE3**
    - **A30E US + EU: D9BADE3**
2. Flywheel housing (rear engine transmission) and power take-off
3. Transmission PT1563
4. Propeller shaft
5. Dropbox IL-1
6. Propeller shaft
7. Front drive axle
    - **A25E: AH56E**

- **A30E: AH64D**

8. Propeller shaft (steering joint)
9. Propeller shaft (frame joint)
10. Propeller shaft
11. Front bogie axle (load unit) with power divider 6x6

    - **A25E: AH56F**
    - **A30E: AH64E**

12. Propeller shaft
13. Rear bogie axle (load unit)

    - **A25E: AH56G**
    - **A30E: AH64F**

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Document Title:	Function Group:	Information Type:	Date:
Description	**410**	**Service Information**	**2014/7/18**
Profile: **ART, A25E 4x4 [GB]**			

Description

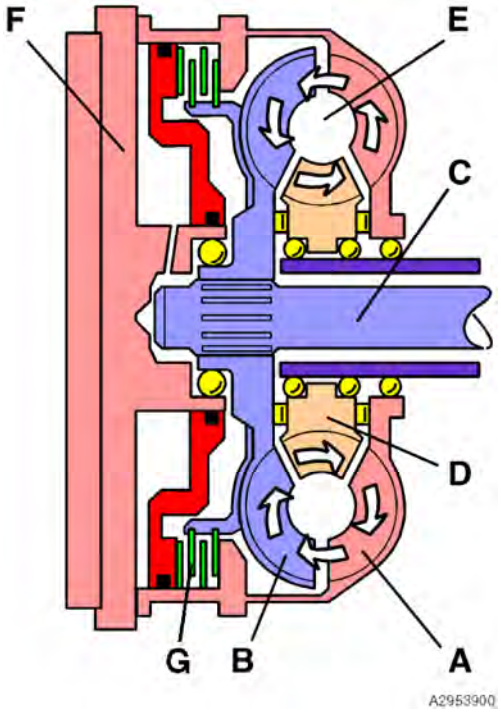

Figure 1

A. Pump rotor
B. Turbine rotor
C. Turbine shaft
D. Stator
E. Space
F. Engine flywheel
G. Lock-up

The torque converter consists of a pump rotor (A), a turbine rotor (B) which is connected to a turbine shaft (C), and a stator (D). The space (E) between the pump rotor and the turbine rotor is filled with oil.
The pump rotor is attached to the engine flywheel (F). When the flywheel starts to turn, the impellers on the pump rotor force the oil to flow. The oil flow from the pump rotor flows over to the turbine rotor and forces it to turn in the same direction as the pump rotor.

The stator, located between the pump rotor and the turbine rotor, is provided with a free-wheel so that, when i.e. Lock-up clutch is applied, it can rotate freely in one direction. The impellers on the stator direct the oil flow from the turbine rotor back to the impellers on the pump rotor.

The torque converter provides smooth transmission of the power from the engine to the transmission. The power is transmitted to the turbine shaft (C), hydraulically or via the direct clutch (Lock-up) (G). Some of the engine power is transmitted directly to the transmission's oil pumps via a drive sleeve.

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Service Information

Document Title:	Function Group:	Information Type:	Date:
Lock-up clutch	**410**	**Service Information**	**2014/7/18**
Profile: **ART, A25E 4x4 [GB]**			

Lock-up clutch

In order to prevent losses in the torque converter when it is not needed, for example, when operating at a constant speed, the pump rotor and the turbine rotor are locked together by a direct clutch disc called Lock-up (G). It is engaged when the control unit senses the correct speed (rpm) relation between the turbine speed sensor (SE4213) and input speed sensor (SE4212).

The Lock-up function is "self-teaching", which means that the engagement time (filling time) is automatically adapted with consideration of wear and manufacture tolerances.

Document Title:	Function Group:	Information Type:	Date:
Description	**420**	**Service Information**	**2014/7/18**
Profile: **ART, A25E 4x4 [GB]**			

Description

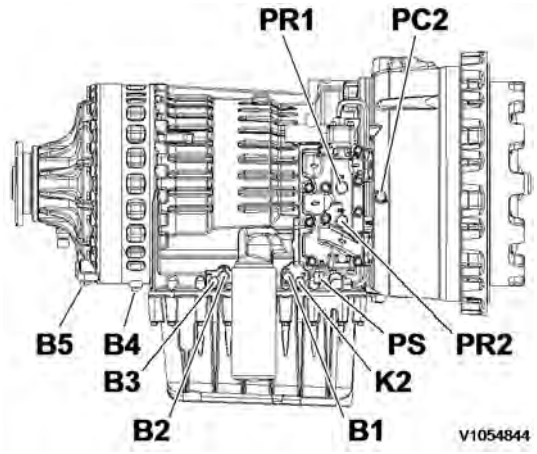

Figure 1
Transmission PT1563, right view

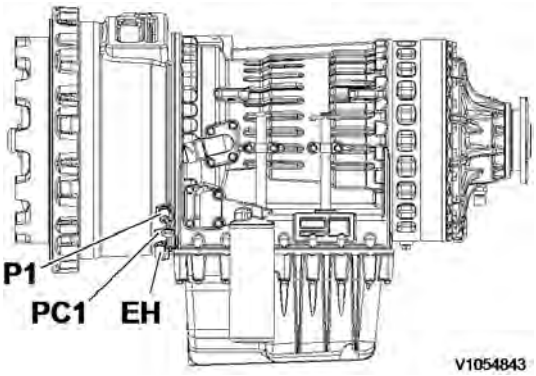

Figure 2
Transmission PT1563, left view

PT1563 is a fully automatic planetary transmission with a built in hydraulic retarder (brake).
The torque converter has a stator and direct clutch (Lock-up).
The transmission has six forward gears and two reverse gears.
Gearshifting is controlled by the position of the gearshift selector and an electronic control unit. Engagement of gears is controlled by the electro-hydraulic control system.

The engine output torque is transmitted and reinforced by the torque converter to the transmission.
The hydraulic torque transmission is automatically disengaged by the direct clutch (Lock-up) and results in a mechanical torque transmission.
The transmission is supplied with hydraulic pressure from two pumps driven by the engine via the torque converter.
The retarder is a hydraulic brake in the transmission that is used when braking the machine.
Gears are selected using the gearshift selector. Engagement of gears is controlled by the control unit after impulses from sensors for engine speed and machine speed. Clutches and brakes are activated by solenoids via relay valves in the transmission control system.
When shifting gears, a clutch/brake is engaged at the same time as the brake for the previous gear is disengaged.

When a specific gear is selected, a combination of clutches and brakes are applied according to the following table.

	Clutches		**Brakes**					**Solenoids**									
	K1	K2	B1	B2	B3	B4	B5	MA 4201	MA 4202	MA 4203	MA 4204	MA 4205	MA 4206	MA 4207	PWM 4201	PWM 4202	PWM 4203
Reverse 1		(a)					(a)	(a)				(a)		(a)	(c)	(c)	(c)
Reverse 2		(a)				(a)			(a)		(a)			(a)	(c)	(c)	(c)
Neutral N							(b)	(a)				(a)			(c)	(c)	
Forward 1	(a)						(a)	(a)				(a)	(a)		(c)	(c)	(c)
Forward 2	(a)					(a)			(a)		(a)		(a)		(c)	(c)	(c)
Forward 3	(a)				(a)			(a)		(a)			(a)		(c)	(c)	(c)
Forward 4	(a)		(a)						(a)				(a)		(c)	(c)	(c)
Forward 5	(a)			(a)				(a)					(a)		(c)	(c)	(c)
Forward 6	(a)	(a)											(a)	(a)	(c)	(c)	(c)

(a) Activated
(b) Activated with low pressure
(c) Gives a variable modulation pressure

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Service Information

Document Title:	Function Group:	Information Type:	Date:
Transmission of power	**420**	**Service Information**	**2014/7/18**
Profile: **ART, A25E 4x4 [GB]**			

Transmission of power

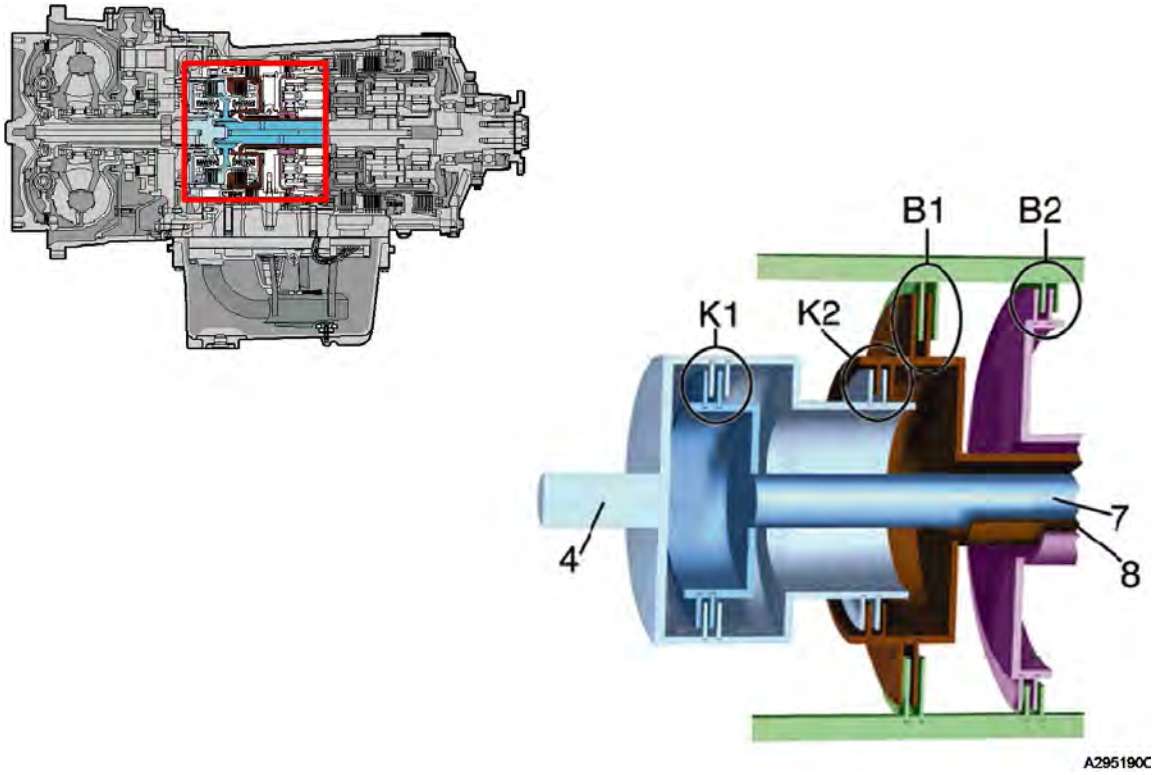

Figure 1

4	Turbine shaft	K1	Clutch 1
7	Main shaft	K2	Clutch 2
8	Tubular shaft	B1	Brake 1
		B2	Brake 2

The power is transmitted from the turbine shaft to the main shaft via clutch K1. The power can also be transmitted to the tubular shaft via the clutch drum between clutch K1 and clutch K2. The brake B1 locks the tubular shaft in the transmission housing.

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Service Information

Document Title:	Function Group:	Information Type:	Date:
Planetary gear	**420**	**Service Information**	**2014/7/18**
Profile: **ART, A25E 4x4 [GB]**			

Planetary gear

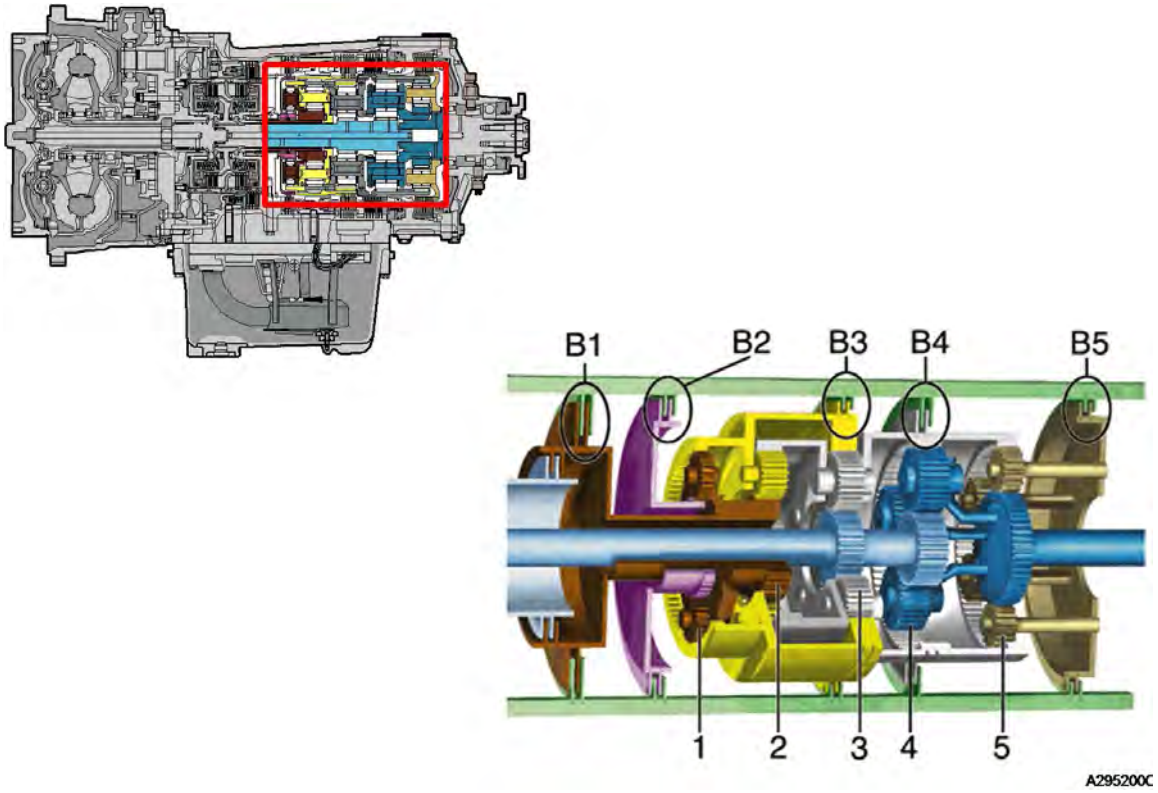

Figure 1

1	Planetary gear 1	B1	Brake 1
2	Planetary gear 2	B2	Brake 2
3	Planetary gear 3	B3	Brake 3
4	Planetary gear 4	B4	Brake 4
5	Planetary gear 5	B5	Brake 5

The transmission has five planetary gears which are linked and transmit power.

Brake B1 locks the planetary gear carrier in planetary gear 1 and the sun gear in planetary gear 2 in the transmission housing.

Brake B2 locks the sun gear in planetary gear 1.

Brake B3 locks the ring gears in planetary gear 1 and 3 as well as it locks the planetary carrier in planetary gear 2.

Brake B4 locks the ring gears in planetary gear 2, 4 and 5 as well as it locks the planetary carrier in planetary gear 3.

Brake B5 locks the planetary carrier in planetary gear 5.

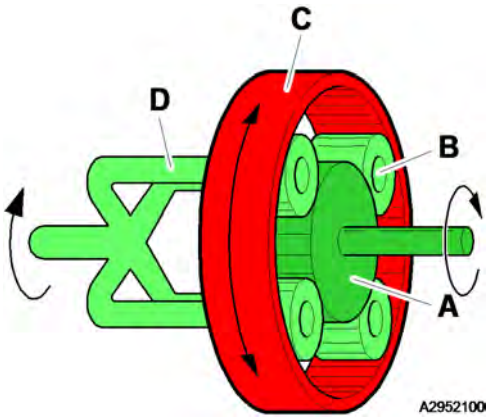

Figure 2

A. Sun gear
B. Planetary gear
C. Ring gear
D. Planetary carrier

A planetary gear consists of a number of gears that are constantly engaged.

There is a sun gear in the middle. Around the sun gear, there are planetary gears that are connected by a planetary carrier, and outermost there is a ring gear with internal teeth. By allowing different parts of the planetary gear to be input respective output shaft, while other parts are braked or connected, two different reduction ratios are obtained.

Document Title: **Transmission, clutches and brakes**	Function Group: **420**	Information Type: **Service Information**	Date: **2014/7/18**
Profile: **ART, A25E 4x4 [GB]**			

Transmission, clutches and brakes

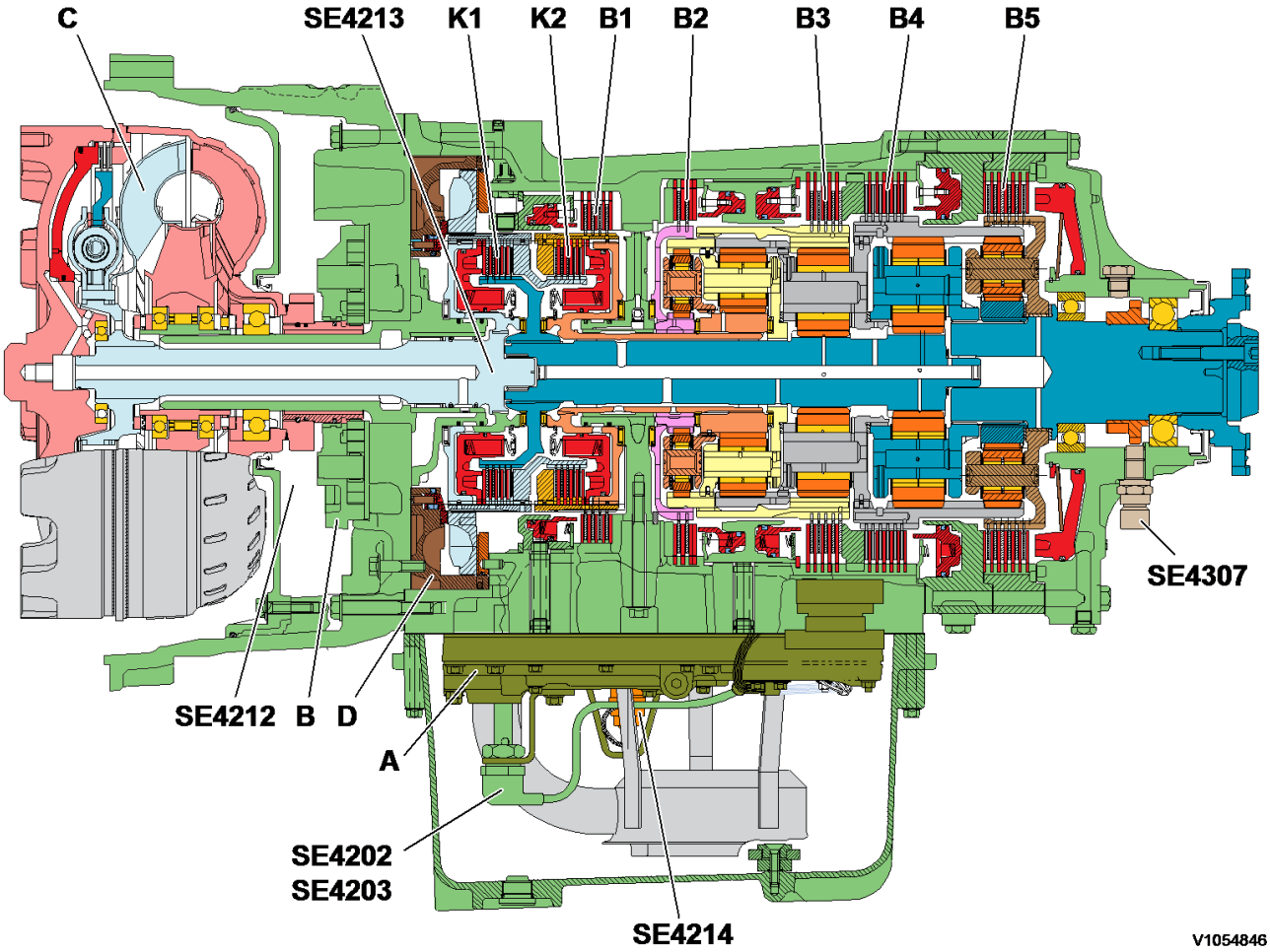

Figure 1
V1054846

Clutches and brakes in transmission	
K1	Forward, 1st - 6th gear
K2	Reverse, 6th gear
B1	4th gear
B2	5th gear
B3	3rd gear
B4	2nd gear, forward and reverse
B5	1st gear, forward and reverse
A	Control system
B	Pump
C	Torque converter

D	Retarder

Sensors and solenoids in transmission	
MA4201 - MA4205/S1 - S5	Solenoids, speed gears
MA4206/S7	Solenoid, forward gear
MA4207/S8	Solenoid, reverse gear, 6th gear forward
PWM4201/S11	Modulating valve, main pressure
PWM4202/S13	Modulating valve, brake pressure
PWM4203/S14	Modulating valve (Lock-up)
SE4202	Sensor, transmission oil temperature (oil sump)
SE4203	Sensor, transmission oil level (oil sump)
SE4212	Sensor, engine speed, input speed (transmission)
SE4213	Turbine speed, behind cover for connector EH
SE4214	Sensor, lubrication oil pressure
SE4307	Sensor, output speed, transmission

The different reduction ratios are obtained through two clutches that rotate in the transmission and five brakes that lock different parts of the planetary gears in the transmission housing.

The clutches are designated as K1 and K2. Brakes are designated as B1-B5.

The function of the forward clutch K1 is to connect the turbine shaft with the main shaft. The reverse clutch K2 connects the turbine shaft with the tubular shaft. The clutches consist of a disc pack where every other disc is made of steel and the others are coated with a friction material. Each disc pack is compressed by a hydraulic piston.

The function of the brakes B1-B5 is to lock the planetary gears' ring gear, planetary carrier or sun gear in the transmission housing, so that they cannot rotate. The brakes have the same design as the clutches, that is, a disc pack where every other disc is made of steel and the others are coated with a friction material. The brake function in the disc packs is obtained by compression with a hydraulic piston.

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