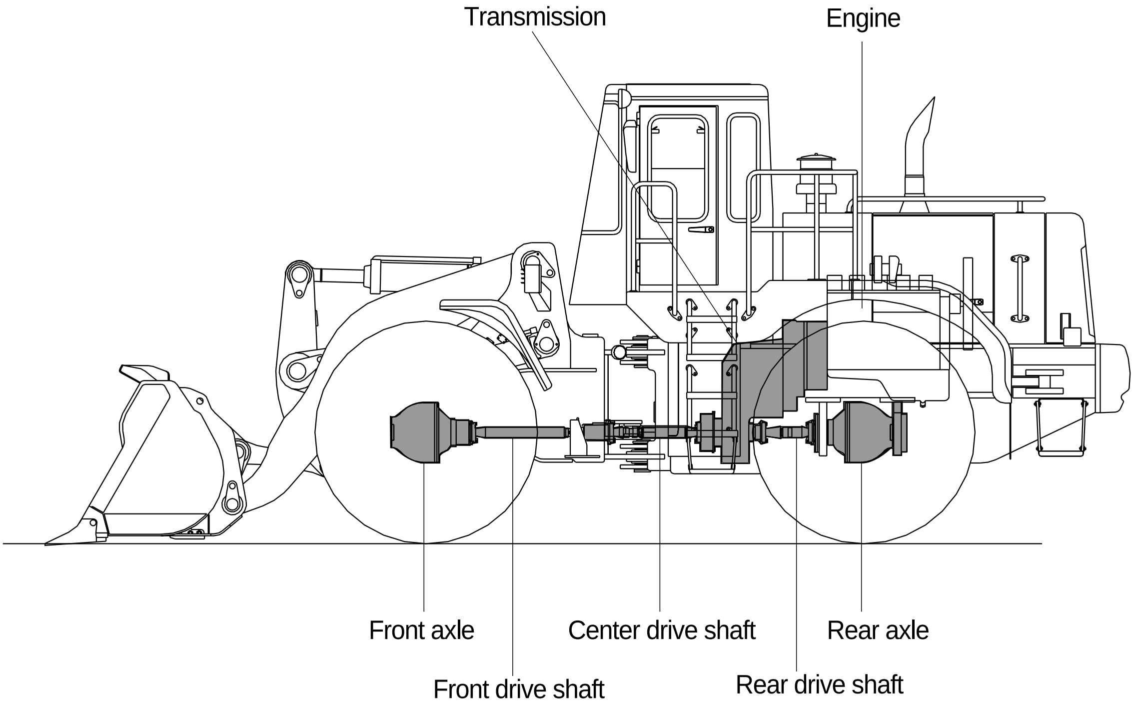
SECTION 3 POWER TRAIN SYSTEM

GROUP 1 STRUCTURE AND FUNCTION

1. POWER TRAIN COMPONENT OVERVIEW



The power train consists of the following components:

- · Transmission
- · Front, center and rear drive shafts
- · Front and rear axles

Engine power is transmitted to the transmission through the torque converter.

The transmission is a hydraulically engaged four speed forward, three speed reverse countershaft type power shift transmission. A drum type parking brake is located on the front of the transmission housing.

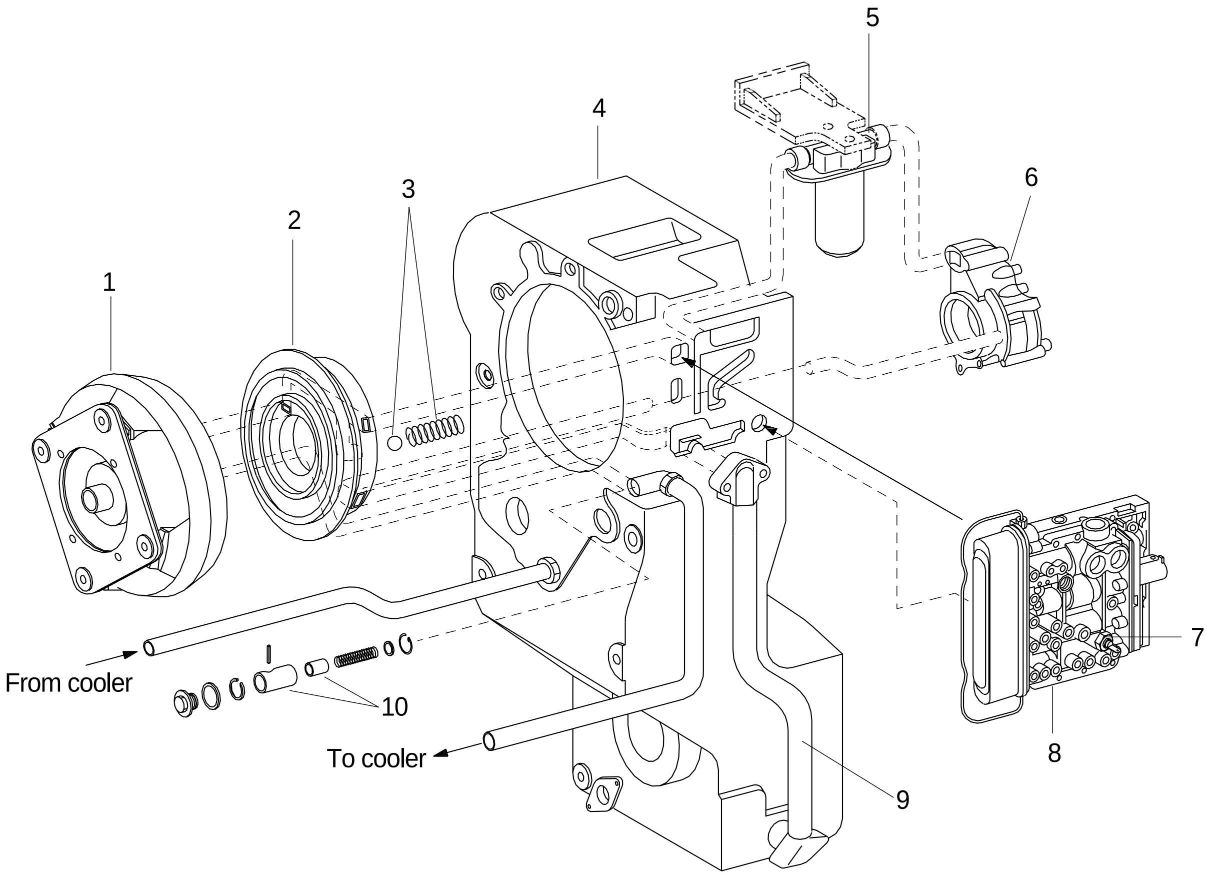
The transmission outputs through universal joints to three drive shaft assemblies. The front drive shaft is a telescoping shaft which drives the front axle. The front axle is mounted directly to the loader frame. The front axle is equipped with limited slip differential.

The rear axle is mounted on an oscillating pivot. The rear axle is equipped with limited slip differential.

The power transmitted to front axle and rear axle is reduced by the pinion gear and ring gear of differential. It then passes from the differential to the sun gear shaft(Axle shaft) of final drive.

The power of the sun gear is reduced by a planetary mechanism and is transmitted through the planetary hub to the wheel.

1) HYDRAULIC SYSTEM



1	Converter	5	Filter	9	Suction tube
2	Oil feed flange	6	Pump	10	Converter minimum pressure regulator
3	Converter relief valve	7	Pressure switch		
4	Housing	8	Control valve		

The transmission hydraulic system is grouped into three circuits :

- Control circuit
- Converter/cooler circuit
- Lube circuit

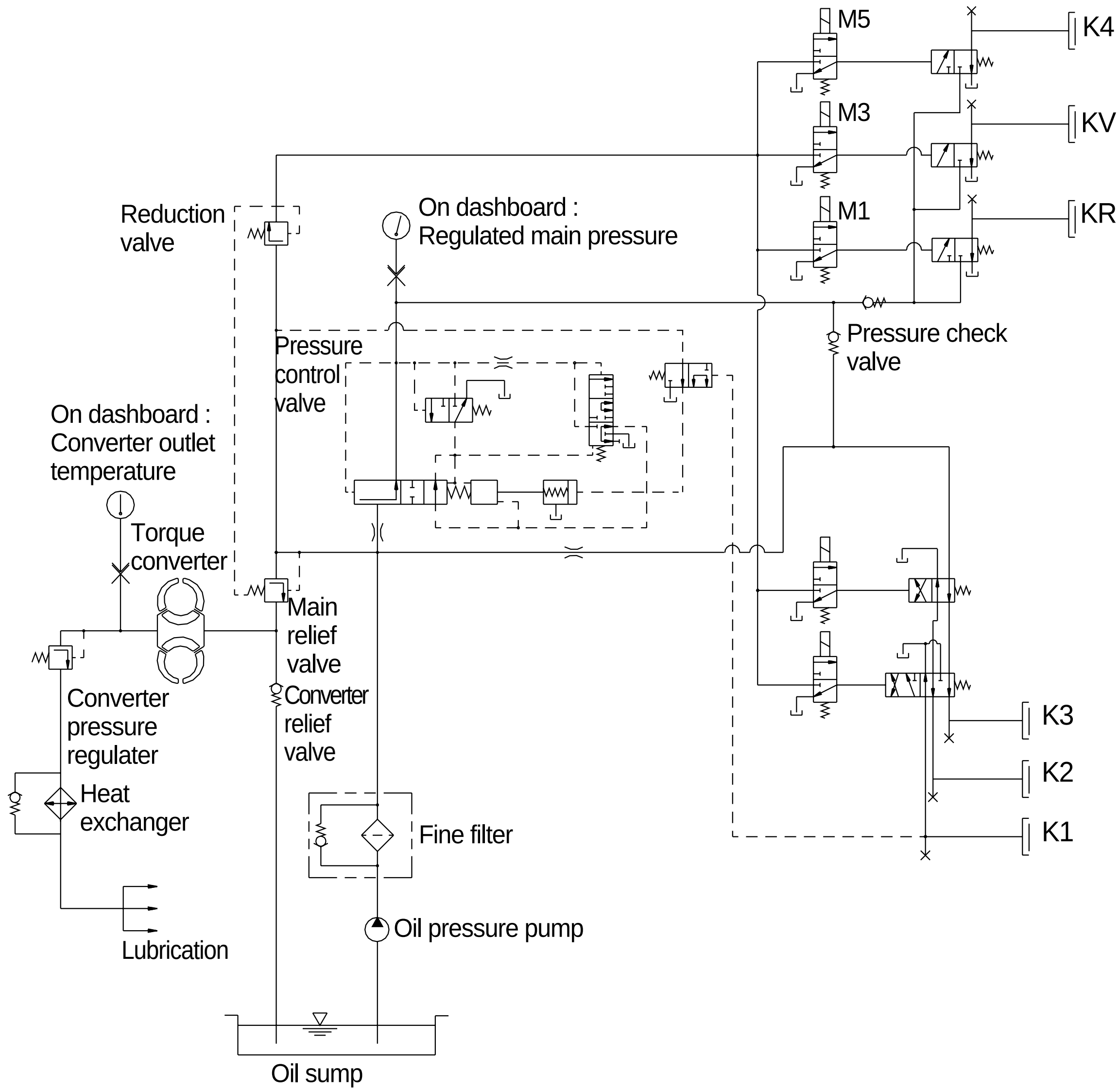
The transmission housing(4) serves as the reservoir for the transmission hydraulic system. Inlet oil flows through a suction screen located in the suction tube(9) where it flows into the transmission housing to the pump oil feed flange(2). The inlet oil flows through the oil feed flange to the inlet of the transmission pump(6).

Outlet oil from the transmission pump flows into the transmission housing where it is routed to the transmission filter(5). The transmission filter is a spin-on filter element with an internal bypass valve.

Filtered pump outlet oil flows back into the transmission housing where it is routed to the transmission control circuit.

Excess flow from the control circuit supplies the converter circuit and is routed back into the transmission where it flows to the oil feed flange. A direct-acting converter relief valve(3) is used to control the maximum pressure in the converter circuit.
The oil feed flange routes oil into and out of the torque converter(1). Converter outlet flow passes through the minimum pressure regulator(10). The minimum pressure regulator is a relief valve which prevents cavitation in the converter circuit. During normal operation, the minimum pressure regulator remains open. Converter outlet oil flows to the oil cooler through passage.
The return flow from the oil cooler enters passage where it supplies the lube circuit. Lube circuit flow fills a passage in the transmission housing. The housing passage supplies lube flow to the three countershaft assemblies.

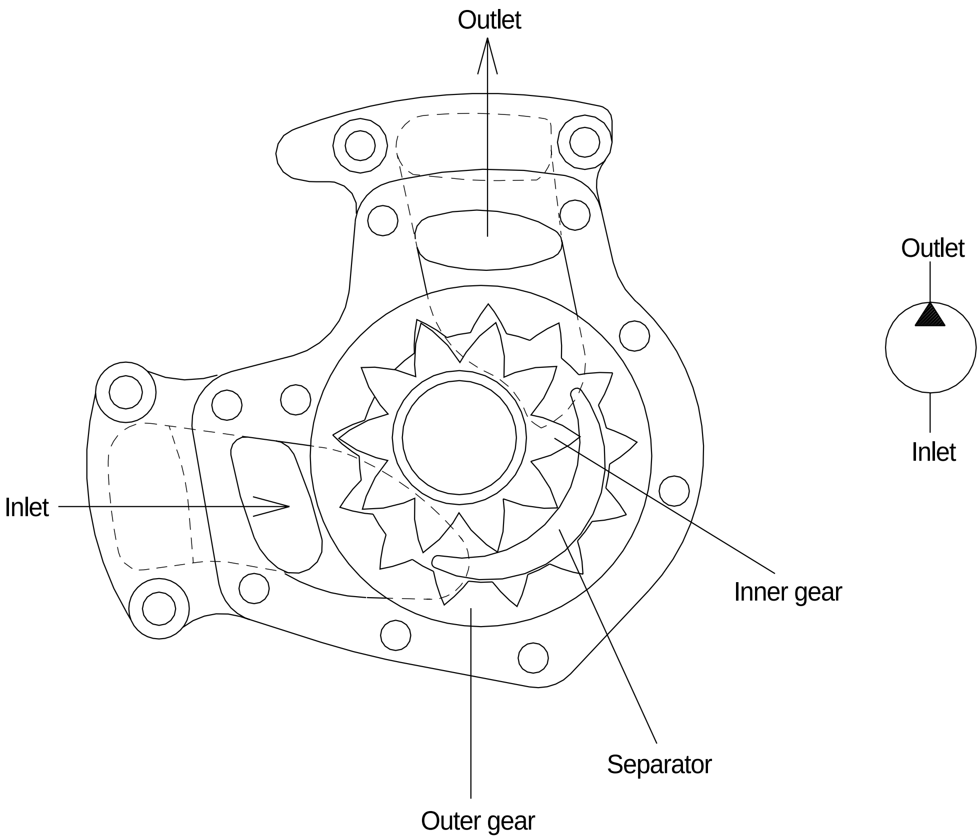
2) HYDRAULIC CIRCUIT



Speed	Forward				Reverse			Neutral
	1	2	3	4	1	2	3	
M1					×	×	×	
M2	×				×			
M3	×	×	×					
M4	×	×			×	×		
M5				×				

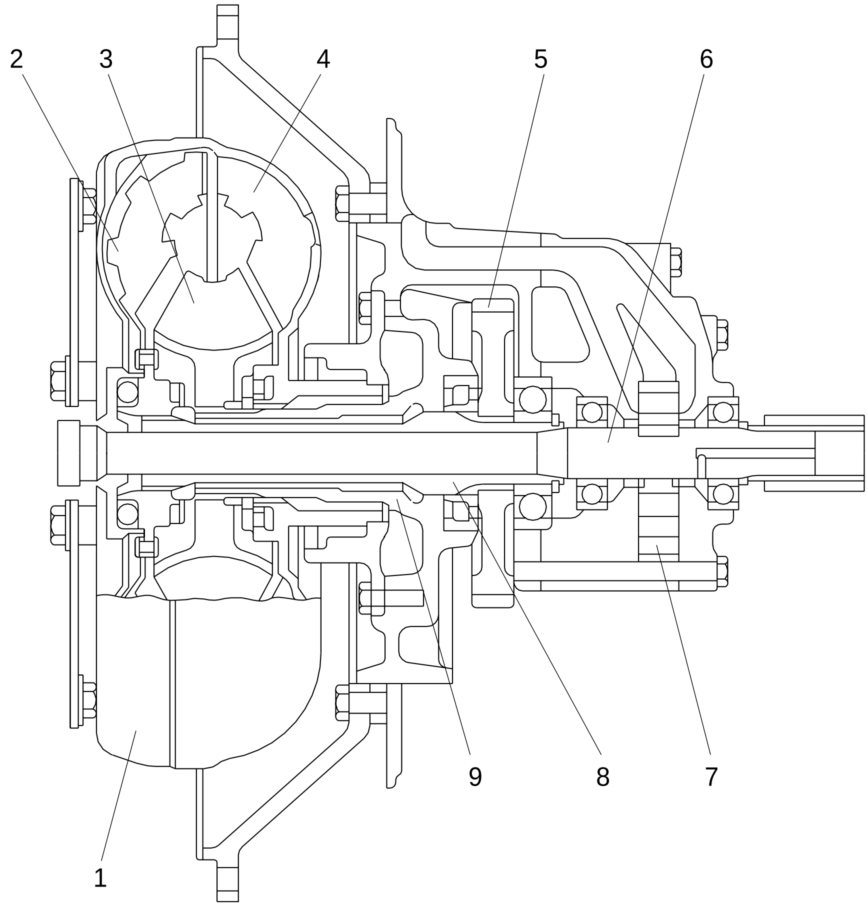
× : Solenoid engaged

3) TRANSMISSION PUMP OPERATION



The transmission pump is a fixed displacement, internal gear type pump. The transmission pump is driven at engine speed off the impeller drive from the torque converter.
During operation, the inner gear, which is splined to the impeller shaft, rotates counterclockwise. The teeth of the inner gear mesh with the teeth of the outer gear, causing it to rotate in the same direction. As the gears come out of mesh by the inlet, a void is created. This causes inlet oil to be drawn into the areas between the gear teeth. As the gear teeth contact the separator, oil is trapped between the gear teeth and carried around to the outlet.
As the gear teeth re-mesh, the space between the gears decreases, forcing oil out the pump outlet.

2. TORQUE CONVERTER OPERATION

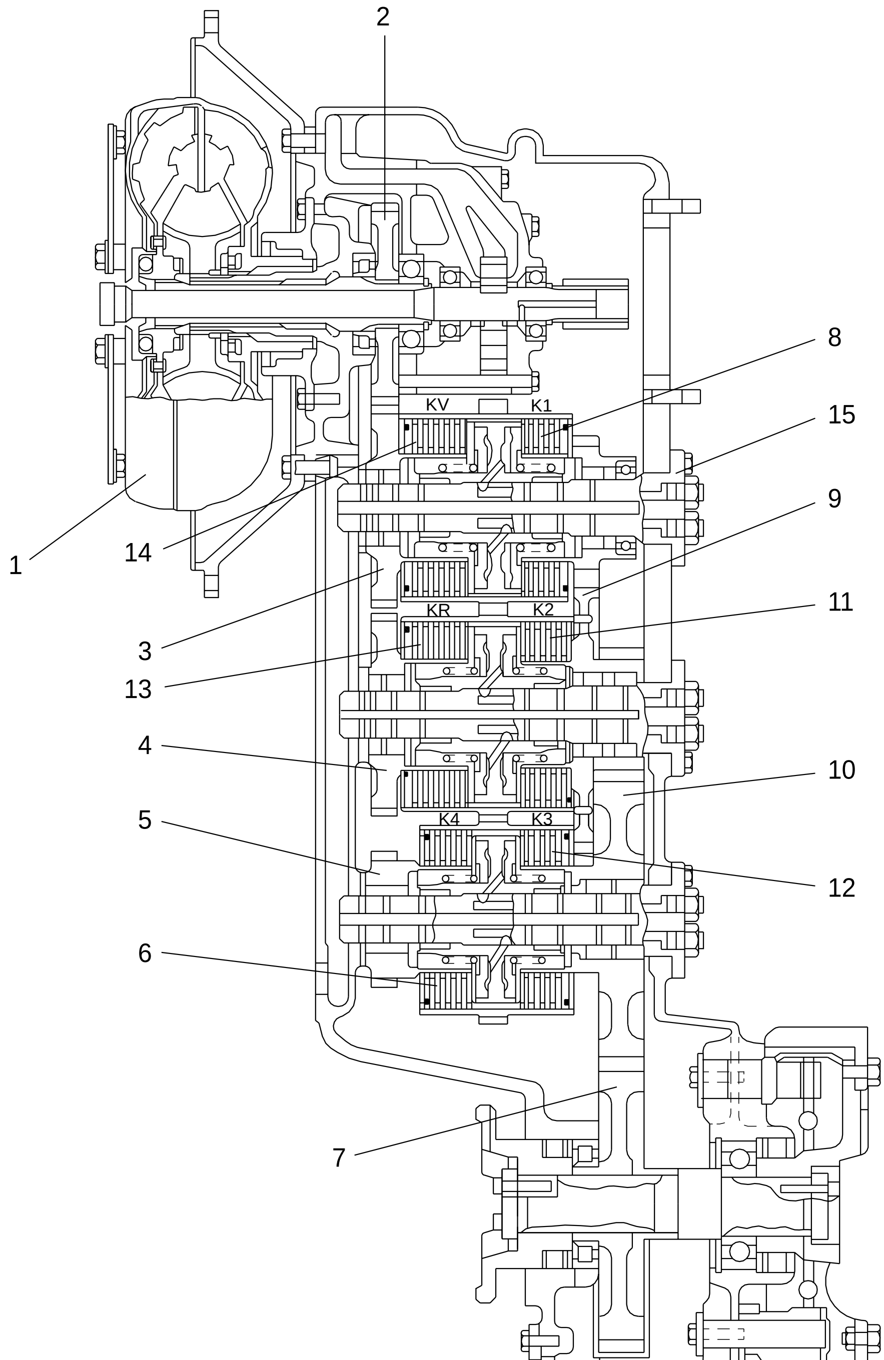


1	Converter housing	4	Impeller	7	Transmission pump
2	Turbine	5	Driver gear	8	Turbine shaft
3	Stator	6	Impeller shaft	9	Ground sleeve

The torque converter splines to the transmission pump assembly. The transmission pump assembly is mounted into the transmission housing as a unit.
The impeller shaft rotates the gears inside of the transmission pump. The coupling on the right end of the impeller shaft drives the main hydraulic pump.
As the impeller rotates, the impeller vanes force oil to flow against the turbine vanes. The turbine rotates the same direction as the impeller. The turbine is splined to the turbine shaft, which rotates the drive gear to transfer torque to the transmission countershafts and clutches. Maximum output torque is produced by the torque converter at stall, where the impeller spinning at maximum speed and the turbine is stationary.
Due to the curvature of the turbine vanes, a stator is used to redirect the oil flow from the inside diameter of the turbine vanes back to the impeller.
The single-phase stator splines to a stationary ground sleeve mounted to the oil feed flange. The oil feed flange bolts to the transmission pump housing.

3. TRANSMISSION

1) TRANSMISSION LAYOUT

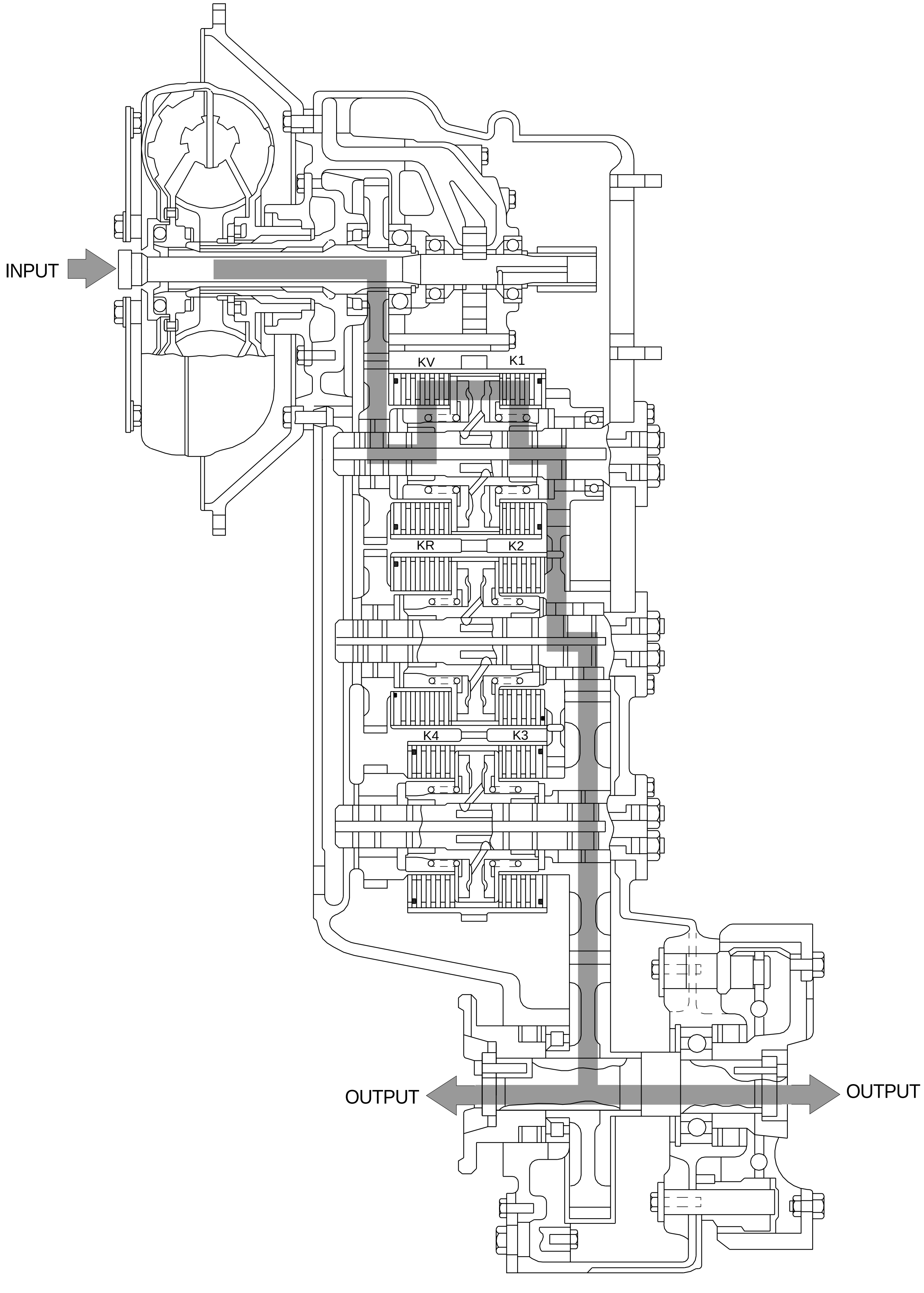


1	Torque converter	6	4th clutch(K4)	11	2nd clutch(K2)
2	Drive gear	7	Output gear	12	3rd clutch(K3)
3	Forward clutch hub	8	1st clutch(K1)	13	Reverse clutch(KR)
4	Reverse clutch hub	9	2nd clutch hub	14	Forward clutch(KV)
5	4th clutch hub	10	3rd clutch hub	15	Countershaft

2) TRANSMISSION OPERATION

(1) Forward

① Forward 1st



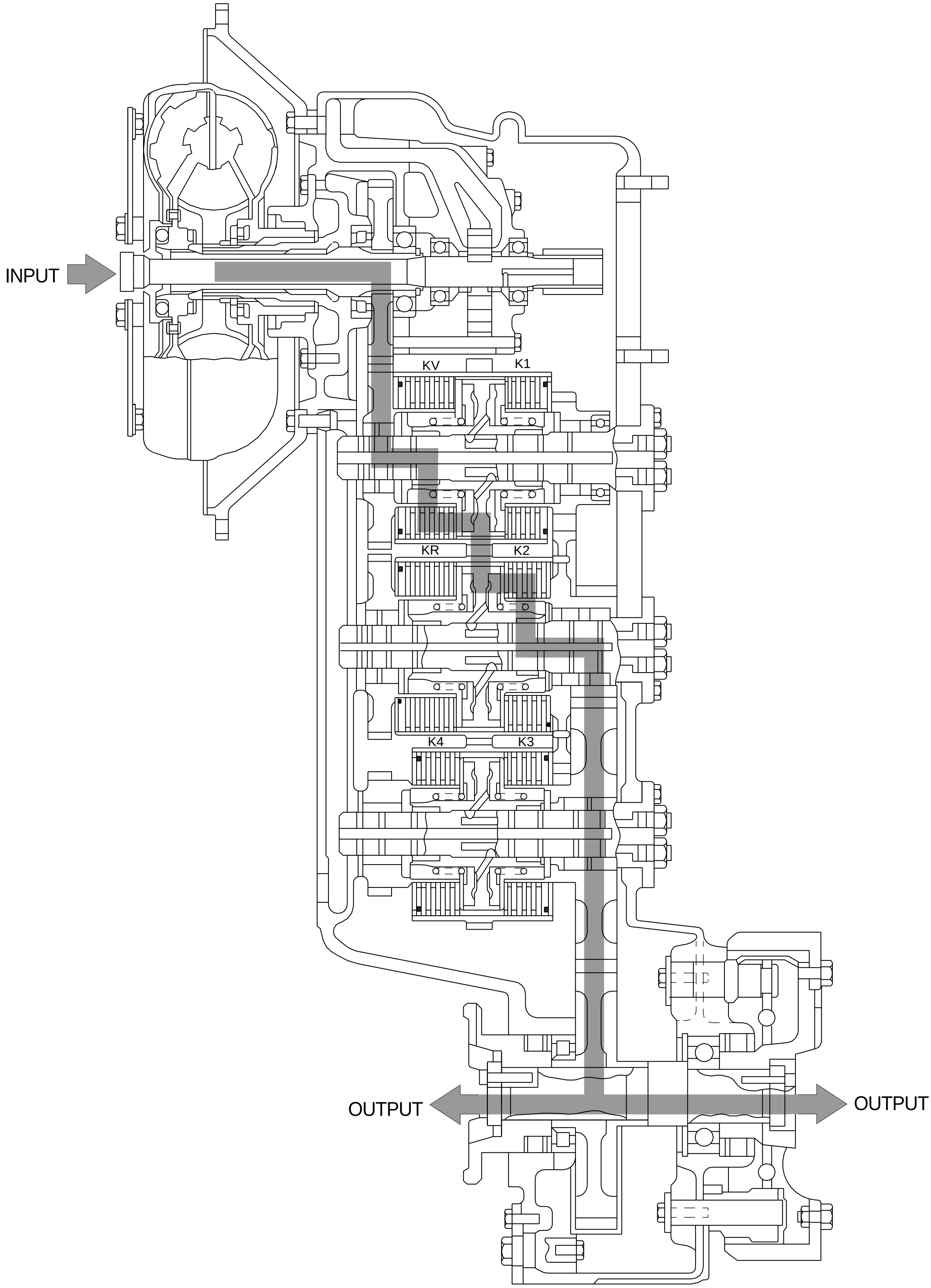
With the transmission in first forward, the forward clutch and the first speed clutch are engaged.

The torque converter supplies torque to the drive gear which meshes with the gear on the forward clutch hub.

Main pressure oil is routed through drilled passages in the top countershaft to the forward and first speed clutches. This causes the pistons to move, compressing the plates and disks causing both clutches to rotate as a unit through the upper clutch drum.

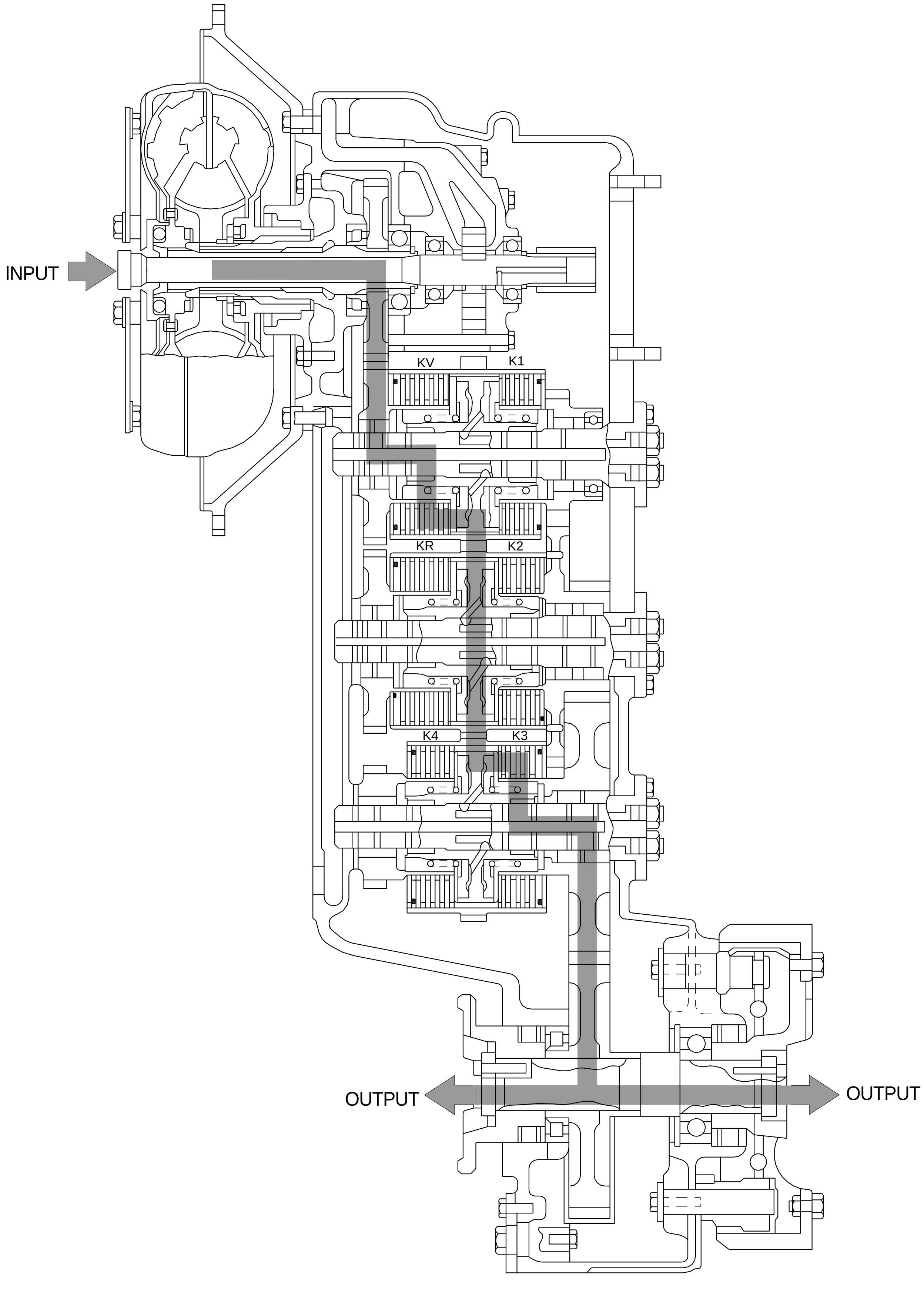
The gear on the first speed hub meshes with a gear on the second speed hub. The second speed hub gear meshes with a gear on the third speed hub, transferring torque to the output gear which drives the output shafts.

② Forward 2nd



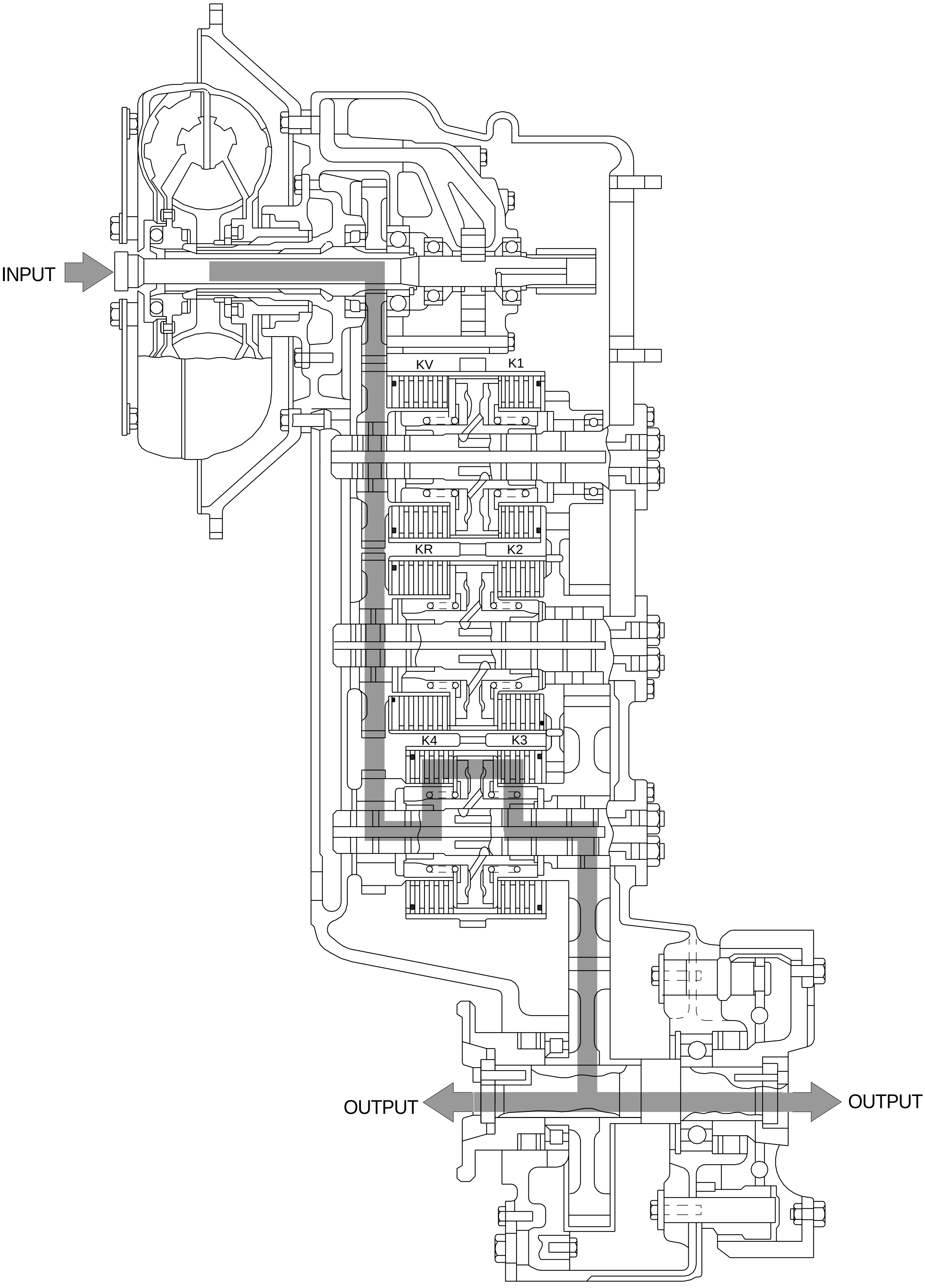
With the transmission in second forward, the forward clutch and second speed clutch are engaged.
The torque converter supplies torque to the drive gear which meshes with a gear on the forward clutch hub.
Main pressure oil is routed through a drilled passage in the top countershaft. This causes the forward clutch piston to move to the left and compress the plates and disks which lock the forward clutch hub to its drum(Upper drum). The clutch drums have gear teeth machined on their outside diameter. The upper and lower drums are in constant mesh with the center drum.
Main pressure oil is also routed through a drilled passage in the center countershaft. This causes the piston in the second speed clutch to move to the right, compressing the plates and disks which lock the second speed clutch to its drum(Center drum).
Torque is transferred from the forward clutch hub through the upper drum to the center drum which rotates the second speed hub. The gear on the second speed hub meshes with the gear on the third speed hub which transfers torque to the output gear. The output gear rotates the output shafts.

③ **Forward 3rd**



With the transmission in third forward, the forward clutch and third speed clutch are engaged.
The torque converter supplies torque to the drive gear which meshes with a gear on the forward clutch hub.
Main pressure oil is routed through a drilled passage in the top countershaft. This causes the piston in the forward clutch to move to the left, compressing the plates and disks. This locks the forward clutch hub to the upper drum which has gear teeth machined into its outside diameter. The upper drum meshes with the gear teeth on the reverse and second speed drum. The gear teeth on the reverse and second speed drum mesh with gear teeth on the lower drum, causing it to rotate.
Main pressure oil is routed through as drilled passage in the lower countershaft. This causes the piston in the third speed clutch to move to the right, compressing the plates and disks. With the third speed clutch engaged, the lower drum rotates the third speed hub which meshes with the output gear. The output gear rotates the drive shafts.

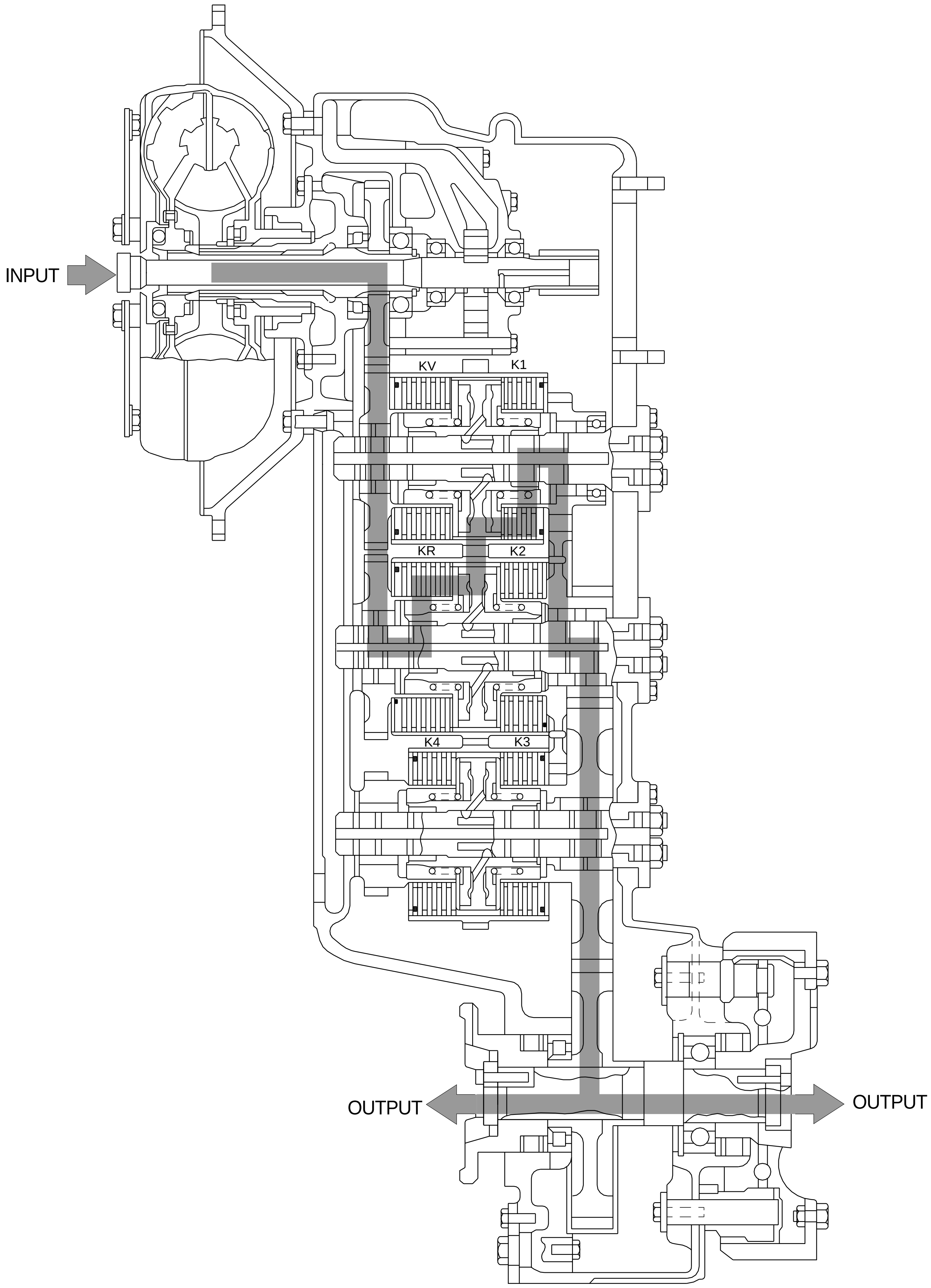
④ Forward 4th



With the transmission in fourth gear forward, the third and fourth speed clutches are engaged. The torque converter supplies torque to the drive gear which meshes with the gear on the forward clutch hub. With the clutches and countershafts assembled in the transmission housing, the forward clutch hub gear meshes with the fourth speed hub through an idler gear.
Main pressure oil is routed through the drilled passages in the lower countershaft to the fourth and third speed clutches. This causes both clutch pistons to move to the left and right respectively, compressing the plates and disks. The fourth speed hub will rotate the third speed hub through the lower drum which rotates the output gear. The output gear rotates the drive shafts.

(2) Reverse

① Reverse 1st



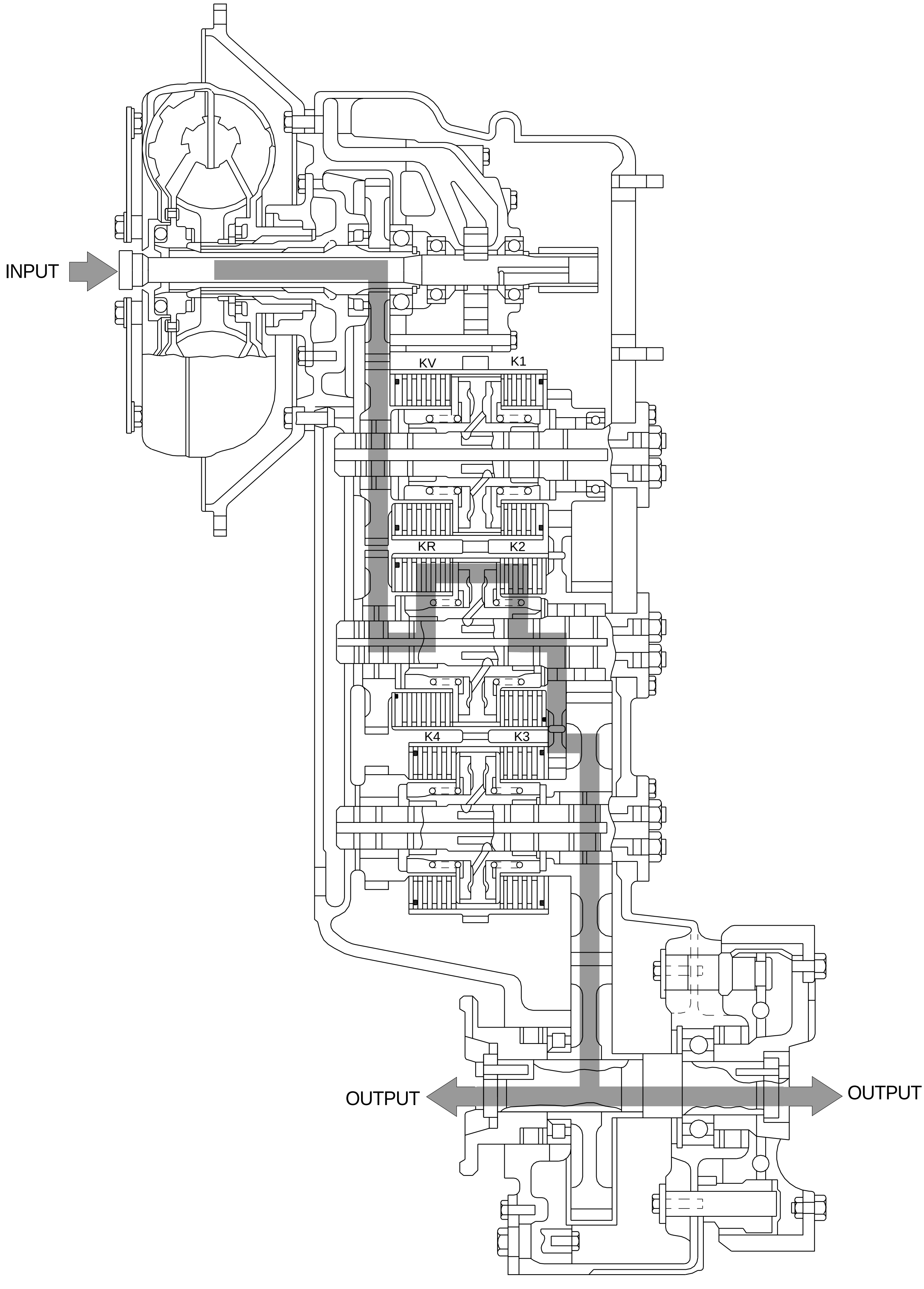
With the transmission in first gear reverse, the reverse clutch and first speed clutch are engaged. The torque converter supplies torque to the drive gear. The drive gear meshes with the gear on the reverse clutch hub.

Main pressure oil is routed thought a drilled passage in the center countershaft. This causes the piston in the reverse clutch to move to the left, compressing the plates and disks. The reverse clutch rotates the center clutch drum. The center clutch drum has teeth machined into its outside diameter. These teeth mesh with the teeth on the outside diameter of the upper clutch drum.

Main pressure oil is routed through a drilled passage in the upper countershaft. This causes the piston in the first speed clutch to move to the right, compressing the plates and disks. The upper drum rotates the first speed hub.

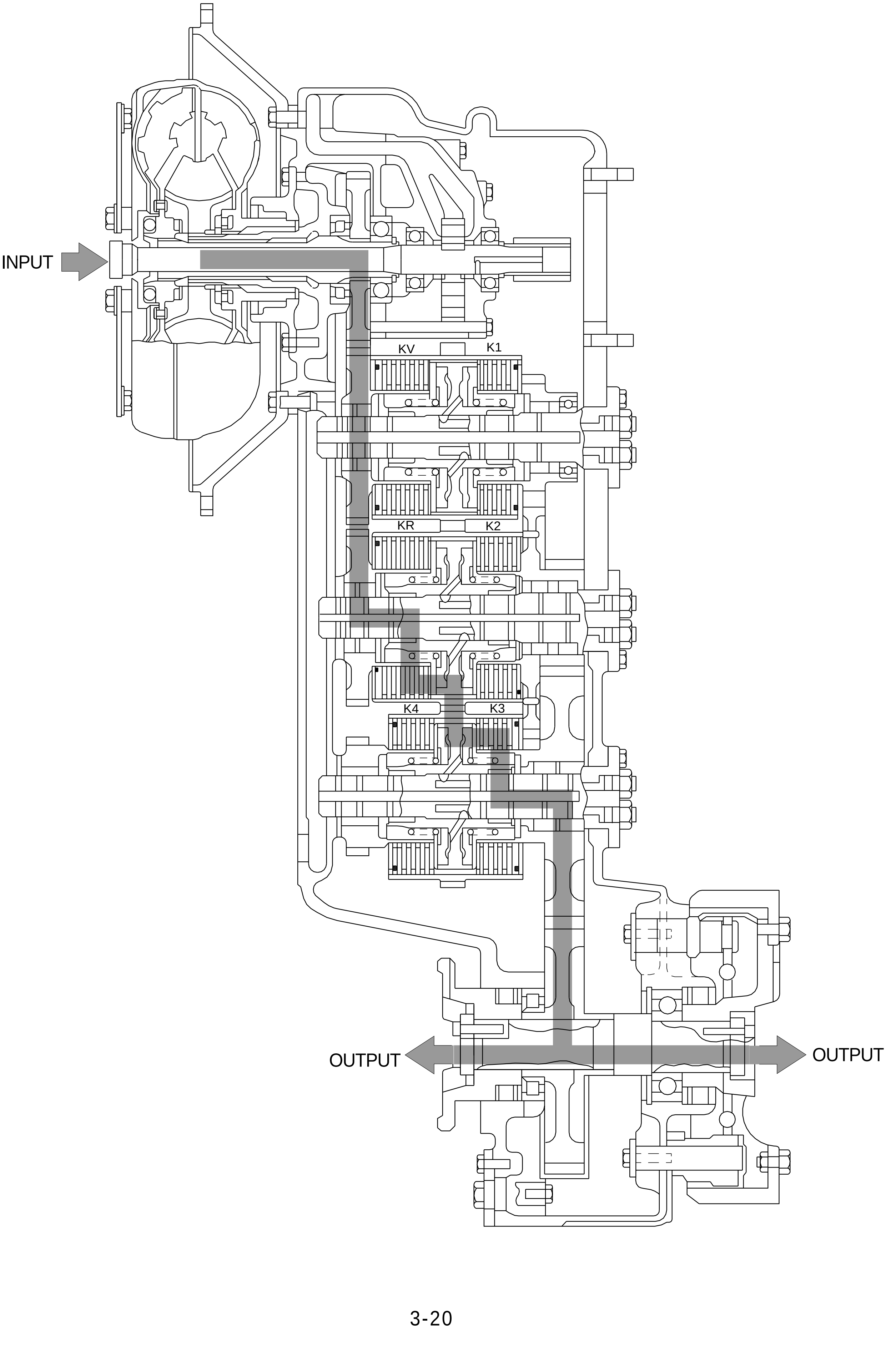
The gear on the first speed hub meshes with the gear on the second speed hub. The second speed hub meshes with the gear on the third speed hub which rotates the output gear. The output gear rotates the drive shafts.

② **Reverse 2nd**



With the transmission in second gear reverse, the reverse clutch and second speed clutch are engaged. The torque converter supplies torque to the drive gear which meshes with the reverse clutch hub.
Main pressure oil is routed through drilled passage in the center countershaft. This causes the pistons in the reverse and second speed clutches to move to the left and right respectively, compressing the plates and disks, causing both clutches to rotate as a unit through the center drum.
The gear on the second speed hub meshes with the gear on the third speed hub which rotates the output gear. The output gear rotates the drive shafts.

③ Reverse 3rd

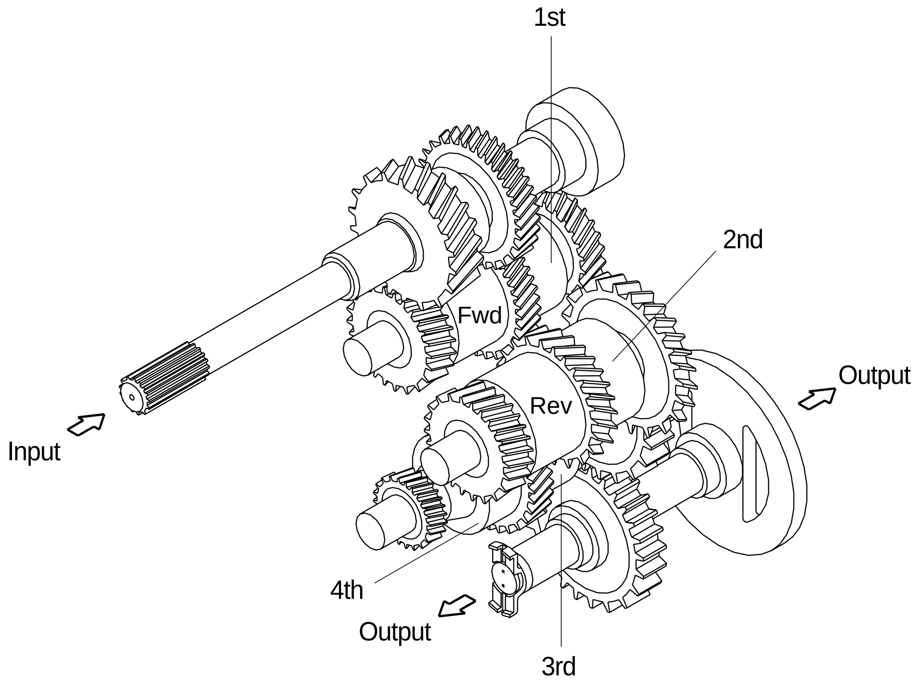


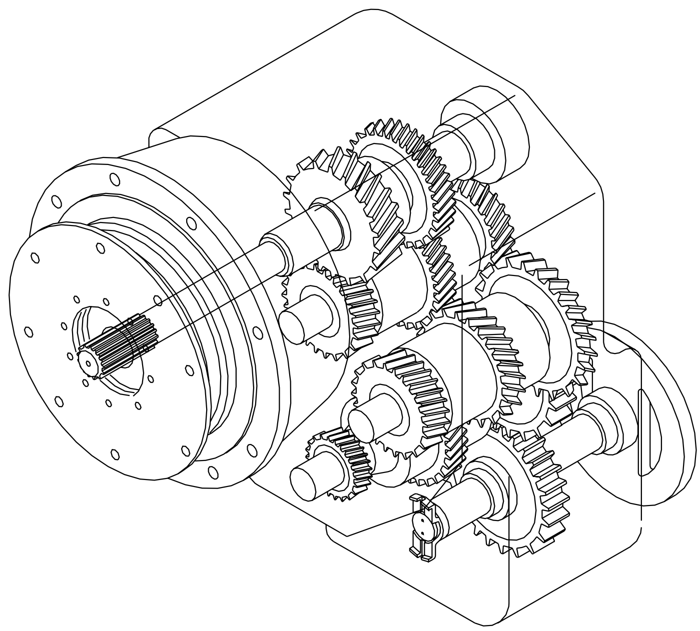
With the transmission in third speed reverse, the reverse clutch and third speed clutch are engaged. The torque converter supplies torque through the drive gear which meshes with the reverse gear hub.

Main pressure oil is routed through a drilled passage in the center countershaft to the reverse clutch piston. This causes the piston to move to the left, compressing the plates and disks. The reverse clutch hub rotates the center clutch drum which has gear teeth machined on its outside diameter. The center clutch drum gear teeth mesh with gear teeth on the lower clutch drum outside diameter, causing it to rotate.

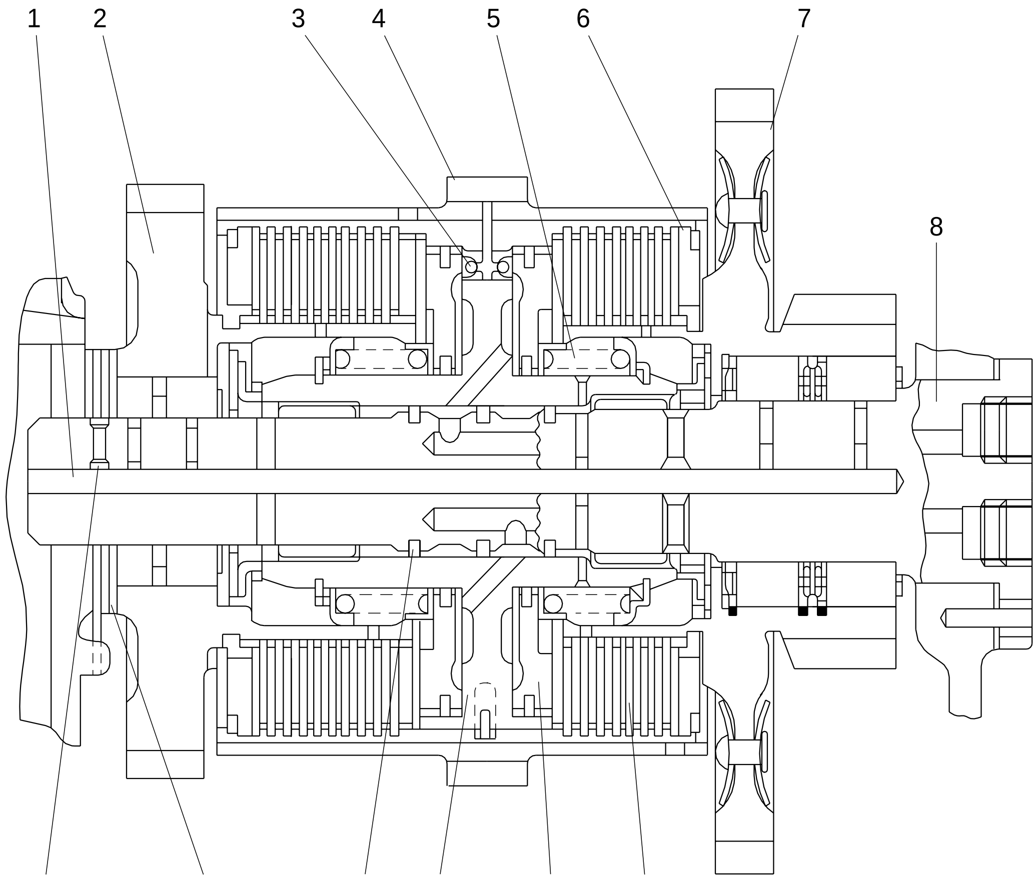
Main pressure oil is routed through a drilled passage in the lower countershaft to the third speed clutch piston. This causes the piston to move to the right, compressing the plates and disks. The lower clutch drum rotates the third speed hub gear which meshes with the output gear. The output gear rotates the drive shafts.

3) CLUTCH AND GEAR ARRANGEMENT





4) CLUTCH OPERATION



1	Lube passage	6	Backing plate	11	Separator
2	Gear hub	7	Gear hub	12	Seal ring
3	Bleed balls	8	Countershaft	13	Shims
4	Drum	9	Plates and disks	14	Lub orifice
5	Return spring	10	Piston		

The clutch assembly consists of two clutch packs inside of a common drum. The drum has external gear teeth machined on its outside diameter. The clutch assembly rotates on a stationary countershaft bolted to the transmission housing. The countershaft has two drilled passage which route main pressure oil to move the pistons.

Main pressure oil is sealed between the separator and the countershaft by seal rings. Lube oil is supplied to the clutches through passage. Clutch lube flow is controlled by orifices pressed into the countershaft.

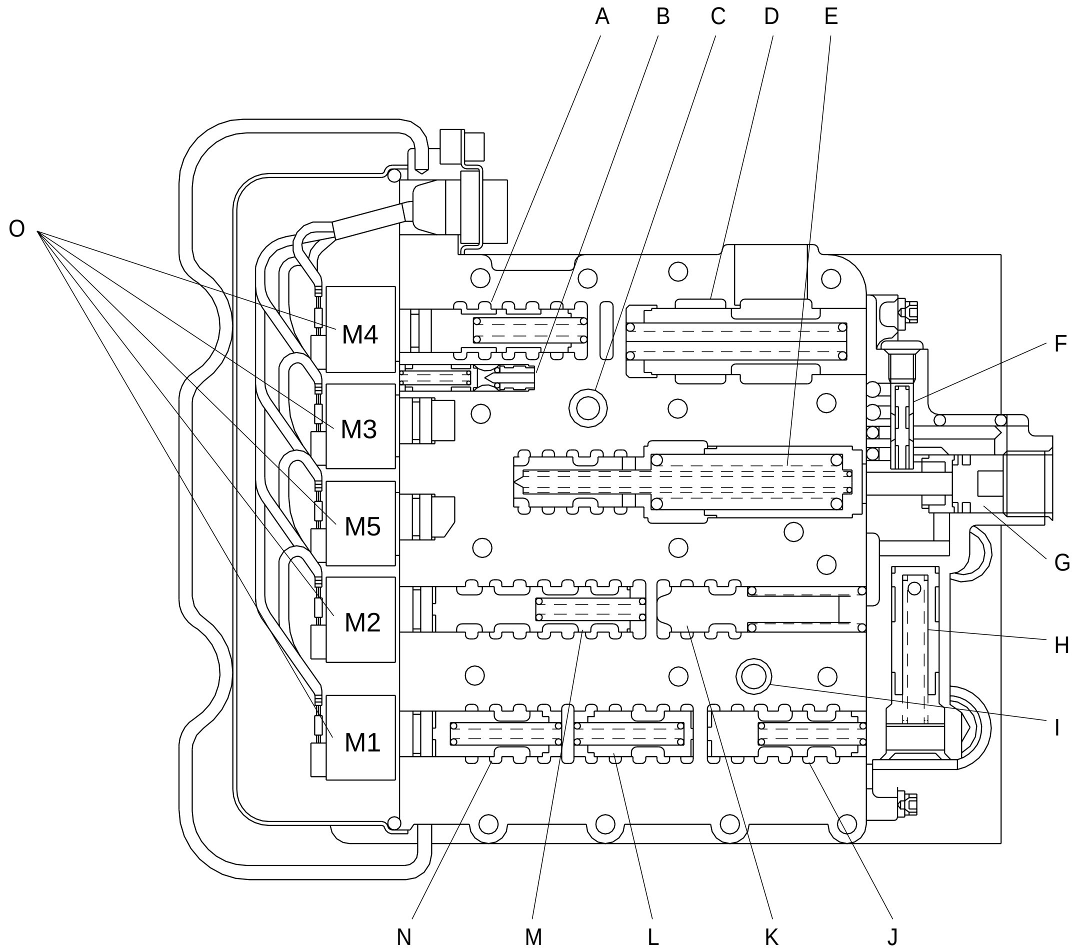
When the clutch is engaged, main pressure oil is routed to the inner area of the piston, moving it against the plates and disks. The plates and disks compress against the backing plate, locking the gear hub to the drum.

When the clutch is disengaged, main pressure oil is routed to return, causing the coil return spring to move the piston back against the separator. This allows the plates and disks to slip, disengaging the gear hub from the drum.

To prevent partial clutch pack engagement, the clutch drum rotation forces the bleed balls off their vertical seats allowing the oil trapped in the piston cavity to escape out the drain hole. If this oil remained behind the clutch piston, the centrifugal force of the rotating drum would force the oil to the outside edge of the piston cavity, moving the piston outward to partially engage the clutch. When the clutch is pressurized, the bleed balls seat to prevent oil leakage out of the piston cavity.

※ **The clutch assemblies have a clearance dimension between the plates and disks when installed. The gear hub has a protrusion measurement. Shims are used to control the end play of the clutch assemblies when they are installed into the transmission housing.**

5) CONTROL VALVE COMPONENTS



A	First and second shift valve	F	Pilot valve	K	Reset valve
B	Solenoid pressure regulating valve	G	Two-stage piston	L	Fourth shift valve
C	Check valve	H	Vent valve	M	First shift valve
D	Pressure reducing valve	I	Check valve	N	Reverse shift valve
E	Modulation valve	J	Forward shift valve	O	Solenoid valve

(1) The transmission control valve assembly regulates the hydraulic control circuit of the transmission. The control valve receives electrical signals from the main controller to energize the solenoids which direct oil to move the shift valves. When the shift valves move, oil pressure drops to start modulation and fill the oncoming clutch pack.

(2) There are four gaskets and three plates between the transmission control valve and the housing. Two plates are used to orifice oil to valves. The middle plate(Duct plate) is used to route oil from the solenoids to the valves and then thru the hoses to transmission shafts. The main valve contains pressure regulating valves, solenoid valves, shift valves, and valves for modulation.

(3) The pressure regulating valve(D) is a spring-loaded spool valve which regulates main pressure oil by controlling flow into the control circuit. Excess oil from the control circuit flows to the torque converter.

(4) Main pressure oil flows to the solenoid pressure regulating valve(B). The regulating valve provides a constant oil pressure to the solenoids and is not affected by modulation. The five solenoid valves(M) direct oil to the shift valves to provide machine direction and speed selection.

M1 Solenoid valve engages reverse shift valve(N).
M2 Solenoid valve engages first shift valve(M).
M3 Solenoid valve engages forward shift valve(J).
M4 Solenoid valve engages first, second shift valve(A).
M5 Solenoid valve engages fourth shift valve(L).

(5) The pressure regulating valve supplies a regulated pressure oil through a plate orifice to the modulation valve(E). The modulation valve is a spring-loaded valve which controls the speed of clutch engagement during a shift.

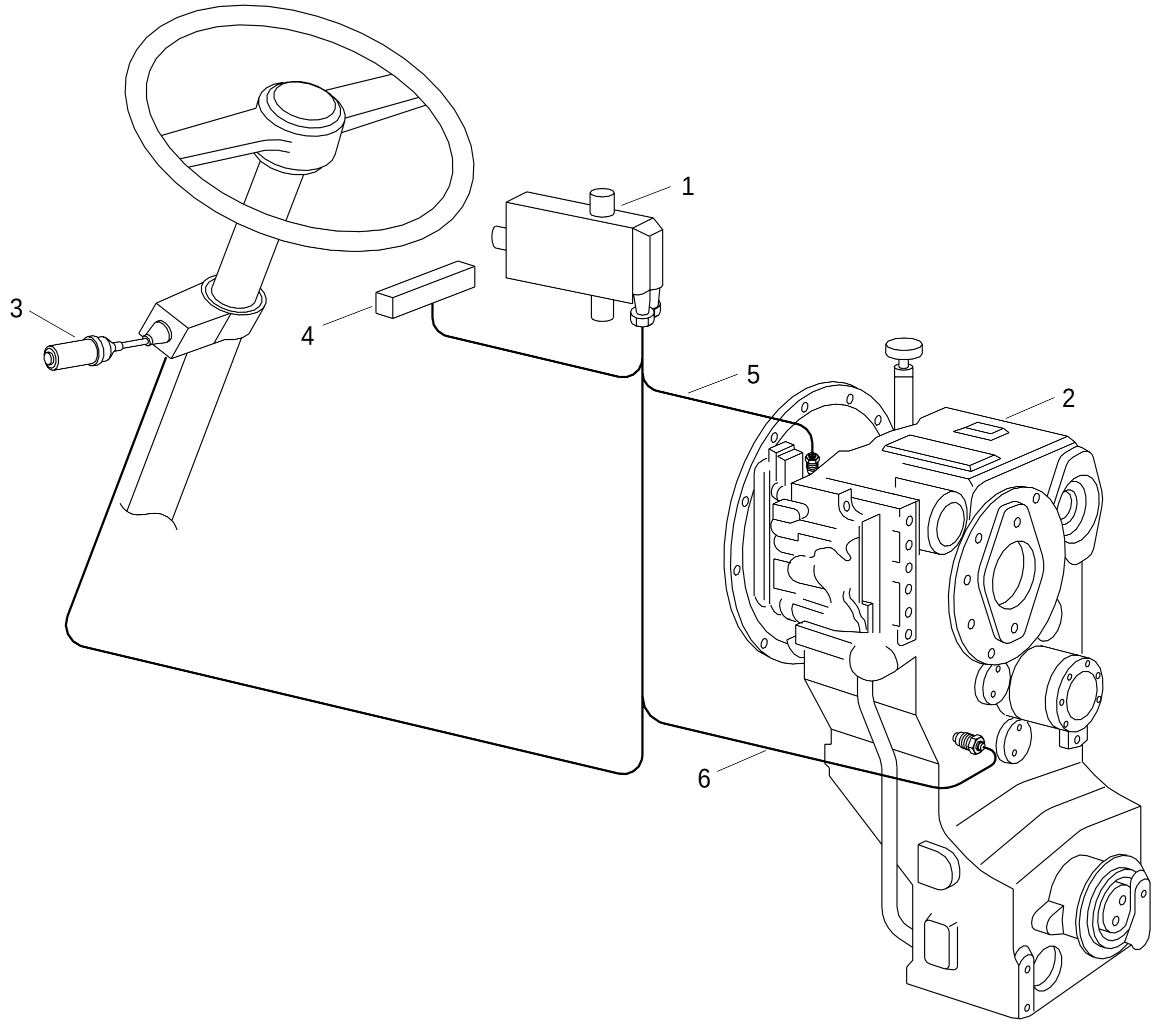
(6) When the first speed clutch is engaged, oil routed to the clutch pack also flows to the pilot valve (F). The pilot valve, which is a spring-loaded shuttle valve, moves and blocks passage to the two-stage piston(G). The two-stage piston is a stepping piston used to preload the modulation valve springs to start clutch modulation at a higher pressure. In first speed, modulation starts at a lower pressure to result in a less aggressive shift. In all other speeds, main pressure flows through the pilot valve to the two-stage piston and preloads the modulation valve resulting in a higher starting pressure.

(7) As modulation ends, the reset valve(K), which is a spring-loaded spool valve, moves and opens a direct path through the modulation valve for fast clutch engagement.

(8) Two clutches have to be engaged for the machine to move. One from the directional clutch packs either forward, reverse, or fourth. One from the speed clutch packs either first, second, or third. Check valves(C and I) are used to prevent flow between a directional shift and a speed shift. These check valves prevent a drop in clutch pack pressure in the engaged clutch.

6) SPEED CONTROL FUNCTIONAL DESCRIPTION

(1) Complete system



1	Transmission control unit	4	Battery	6	Inductive sensor output cable
2	Transmission	5	Control valves cable	7	Control valves
3	Gear selector				

(2) Description of basic functions

A specific speed range selector concept has been developed by ZF for use in wheel loaders equipped with electro-hydraulically controlled power shift transmission, it incorporates the speed range selector(DW-2) and micro-processor control unit(EST-17T).

This system processes all driver's instructions, such as direction of travel, selected gear as well as the current machine speed and offers the following significant advantages:

① High adaptability to engine, machine and operation conditions through specific programming.

② Reversing possibility through all gears.

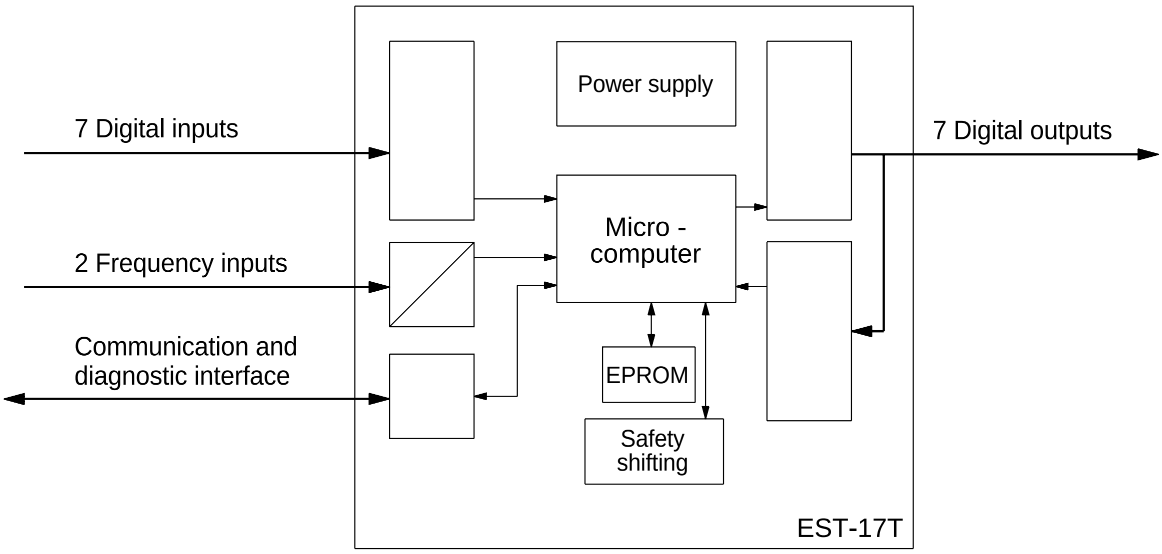
③ Easy KD function(**Semi-automatic**).

④ Waterproof, compact range selector with integrated KD button and neutral position interlock, without any other active interlocks.

⑤ Short circuit proof and overvoltage protected electrical system.

⑥ Many safety features to protect against operating errors(Software).

(3) Block circuit diagram for micro-processor control unit(EST-17T)



(4) Component description

① Gear(speed) selector

The gear selector has been designed for attachment to left of steering column. Positions(Gears) 1-4 are selected by turning, whereas the direction of travel is selected by shifting the lever(Forward (V) - Neutral (N) - Reverse (R)). On transmission with 3 reverse speeds only the gear 3R is selected on gear position 4R.

A neutral position interlock protects against unintentional machine movements during start-up. Lever position D : Drive ; Position N : Shift lever is locked in NEUTRAL position.

② Micro processor control unit

A. General

The short-circuit-poof and overvoltage-protected control unit must be installed in a protected place in the driver's cab. via the by-packed buffers.

The control unit with inserted plug is splash-waterproof.

B. Direct control of solenoid valves

The solenoids of the electro-hydraulic control block at the transmission are directly controlled by the electronics, i.e. without relays. Therefore, in normal practice just the outputs for the starter interlock and reverse lights must be relay-controlled.

C. Gear selection

When ignition is turned on, the electronics remain in stand-by position and are ready for operation when the lever is shifted into NEUTRAL position. Thereupon the gear can be selected.

In general, the following applies for gear selection from NEUTRAL position : If road speed is too high for the preselected gear(Risk of overreving), it is necessary to downshift to the lowest permissible gear and then continue down-shifting in steps of 2.5 seconds until the preselected gear is reached.

D. Kick down function

In gear positions 2V or 2R the 1st gear can be selected any time through slightly pushing the KD button which is integrated in the shift lever. At proper road speed(Approx 95% of max speed of 1st gear) up-shifting to the 2nd gear is performed automatically, however, not before 2.5 seconds.

This KD function remains in force also during reverse shifting, unless shift lever remains in NEUTRAL position not longer than 1 second.

E. Passive reversing interlock

Since the gear selector DW-2 has no active reversing interlock, reversing is possible at any time. Depending on current road speed resulting in :

- Direct reversing is possible at any time in gears 1 and 2(1V ←→ 1R and 2V ←→ 2R).
- The sequence of road-speed-dependent reversing in gears 3 and 4 is as follows :
  - Beyond a programmed speed limit(Normally the max speed of the 2nd gear) reversing is performed via an immediate down-shift to the 2nd gear of the current direction of travel, a shuttle-shift to the 2nd gear of the reverse direction of travel for 1.2 seconds, and finally up-shifts to the preselected gear in steps of 2.5 seconds.

    If speed drops below limit speed, reversing is performed immediately.
  - Below this speed limit, reversing is performed directly, i.e. without prior down-shifts.

F. Up - shifts

If preselected gear is more than 2 gear steps beyond the currently selected gear, up-shifting is performed in steps of 2.5 seconds.

G. Down - shifts

Down - shifts to the 2nd gear are performed immediately, even if gears are being skipped.

If 1st gear is to be selected from either the 3rd or 4th gear, it is necessary to first down - shift to the 2nd gear for 1.2 seconds, and then continue to the 1st gear.

H. Pressure cut - off

The pressure cut - off device in the 1st and 2nd gear forward and reverse is activated by an external positive signal(+). The transmission power-flow is interrupted as long as this positive signal is being transmitted.

I. Cross shifts

If within the locking period of 1.2 seconds not only down but also reverse shifts are performed, the transmission shifts to Neutral position till the end of this interval(Counted from the first selected shifting point).

J. Direct solenoid control in NEUTRAL position

With the gear selector lever in NEUTRAL position certain transmission-specific solenoid combinations are signalled for gear positions 1 and 2. These signals will be eliminated as soon as max speed of 2nd gear is exceeded.

K. Detection of inductive sensor failure

The road speed is determined via the inductive sensor at the output side. Its failure will also be assumed at a vehicle stand-still for longer than 10 seconds, although the 3rd or 4th gear is engaged.

If the electronics have determined an inductive sensor failure, up-shifts beyond the 2nd gear are not possible and from the 3rd and 4th gear, down-shifts can be performed only. Moreover, reverse shifts from the 3rd or 4th gear are only possible to the 2nd gear in the reverse direction of travel. The status inductive sensor failure will be eliminated as soon as the inductive sensor signal can be sensed again. In this case, there is no automatic up-shifting to the preselected higher gear(See **L**).

L. System performance in case of faults

The control unit constantly controls all inputs of the range selector as well as all outputs to the solenoid valves. In case of inadmissible combinations(e.g. cable break, stray signals) the electronics shift immediately to neutral condition and lock all outputs.

The same applies, if certain voltage limits are exceeded or in case of short-circuit.

This lock can be eliminated by shifting the range shift lever through the NEUTRAL position. The same applies for the up-shift interlock after inductive sensor failure.

In case of repeated faults, it is imperative to check the machine's electrical circuit and to exchange defective components immediately.

M. Wiring

All cable connections for solenoid valves, inductive sensor, speed range selector, electronics and machine's electrical circuit are integrated in the compact wiring harness avoiding the individual wiring.

This compact wiring harness is available from production in different lengths.

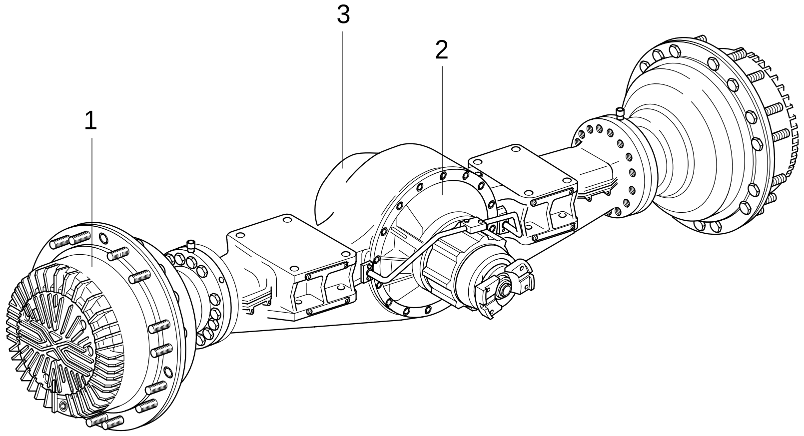
※ **A wiring system of single cables is available for prototype units in order to simplify necessary modifications.**

4. AXLE

1) OPERATION

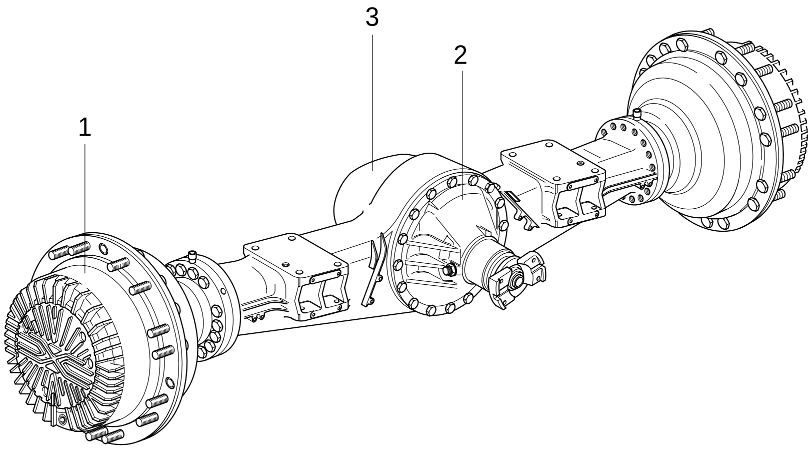
- The power from the engine passes through torque converter, transmission and drive shafts, and is then sent to the front and rear axles.
- Inside the axles, the power passes from the bevel pinion to the bevel gear and is sent at right angles. At the same time, the speed is reduced and passes through the both differentials to the axle shafts. The power of the axle shafts is further reduced by planetary-gear-type final drives and is sent to the wheels.

(1) Front axle



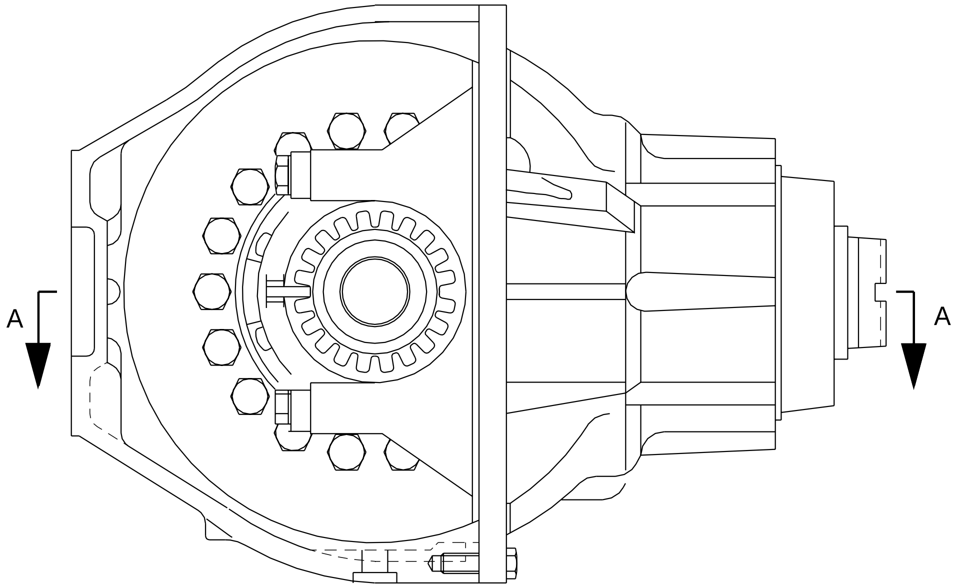
1 Final drive 2 Differential 3 Axle

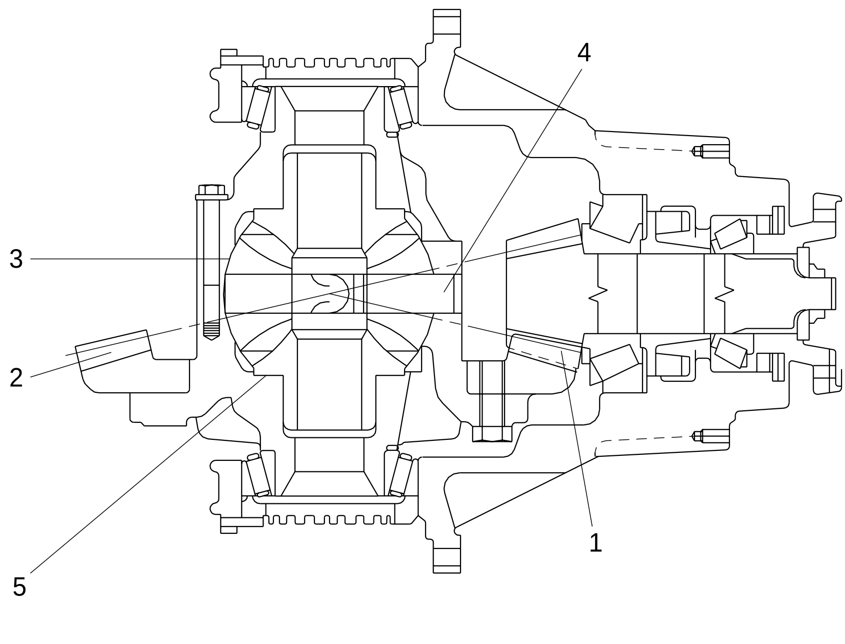
(2) Rear axle



1 Final drive 2 Differential 3 Axle

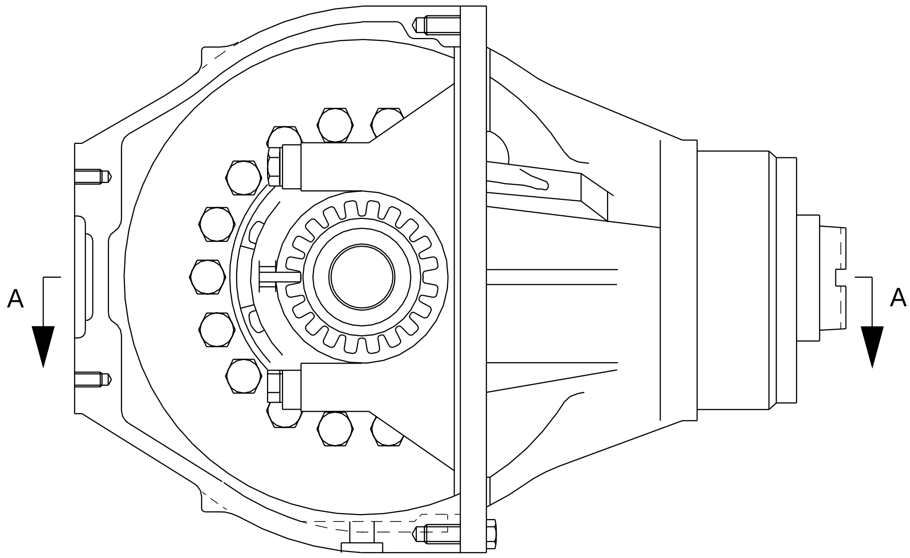
2) SECTION OF FRONT AXLE DIFFERENTIAL

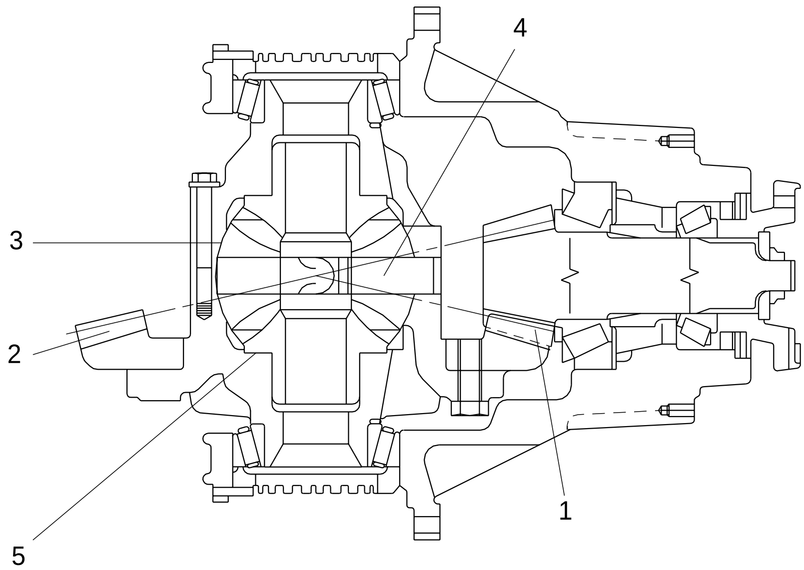




1	Bevel pinion	3	Sun gears	5	Side gear(Differential)
2	Bevel gear	4	Shaft		

3) SECTION OF REAR AXLE DIFFERENTIAL





1	Bevel pinion	3	Sun gear	5	Side gear(Differential)
2	Bevel gear	4	Shaft		

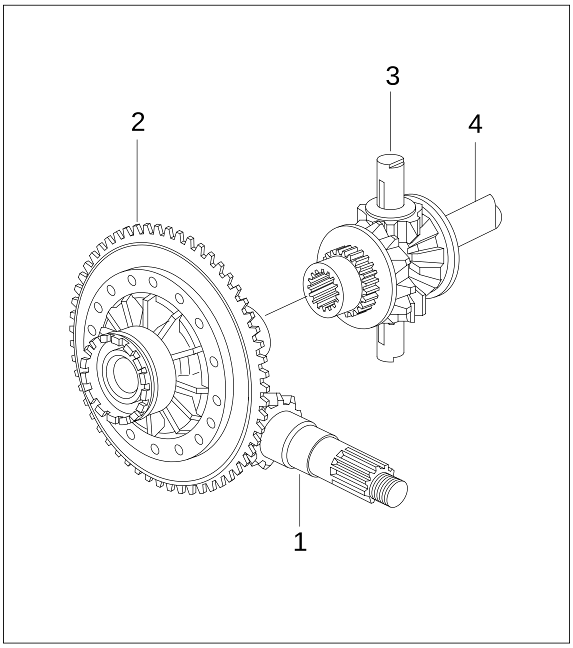
4) DIFFERENTIAL

(1) Description

When the machine makes a turn, the outside wheel must rotate faster than the inside wheel. A differential is a device which continuously transmits power to the right and left wheels while allowing them to turn a different speeds, during a turn.

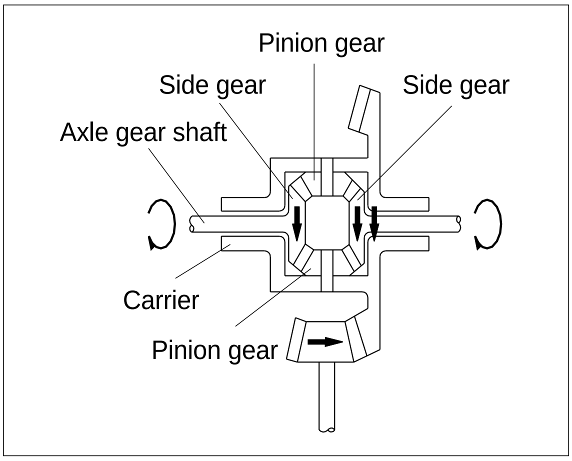
The power from the drive shaft passes through bevel pinion(1) and is transmitted to the bevel gear(2). The bevel gear changes the direction of the motive force by 90 degree, and at the same time reduces the speed.

It then transmits the motive force through the differential(3) to the axle gear shaft(4).



(2) When driving straight forward

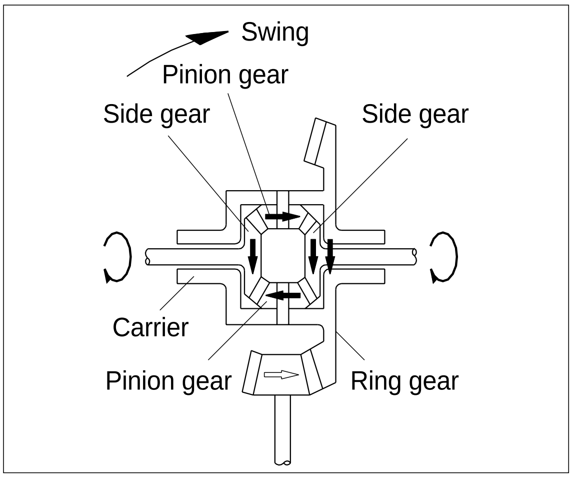
When the machine is being driven straight forward and the right and left wheels are rotating at the same speed, so the pinion gear inside the differential assembly do not rotate. The motive force of the carrier is send through the pinion gear and the side gear, therefore the power is equally transmitted to the left and right axle gear shaft.



(3) When turning

When turning, the rotating speed of the left and right wheels is different, so the pinion gear and side gear inside the differential assembly rotate in accordance with the difference between the rotating speed of the left and right wheels.

The power of the carrier is then transmitted to the axle gear shafts.



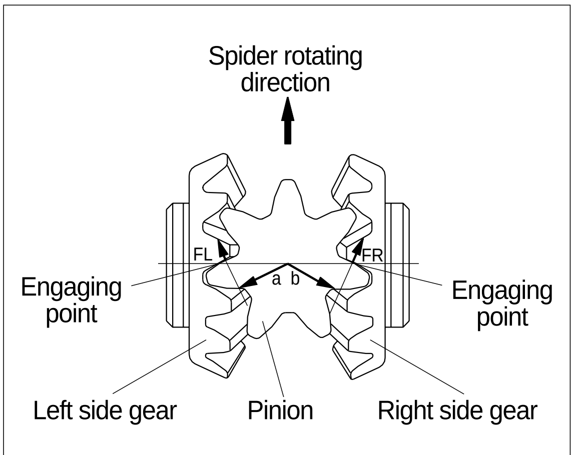
5) TORQUE PROPORTIONING DIFFERENTIAL

(1) Function

① Because of the nature of their work, 4-wheel-drive loaders have to work in places where the road surface is bad.
In such places, if the tires slip, the ability to work as a loader is reduced, and also the life of the tire is reduced.
The torque proportioning differential is installed to overcome this problem.
In structure it resembles the differential of an automobile, but the differential pinion gear has an odd number of teeth.
Because of the difference in the resistance from the road surface, the position of meshing of the pinion gear and side gear changes, and this changes the traction of the left and right tires.

(2) Operation

① **When traveling straight**(Equal resistance from road surface to left and right tires)
Under this condition, the distances involving the engaging points between right and left side gears and pinion-a and b-are equal and the pinion is balanced as FL×a=FR×b. Thus, FL=FR, and the right and left side gears are driven with the same force.

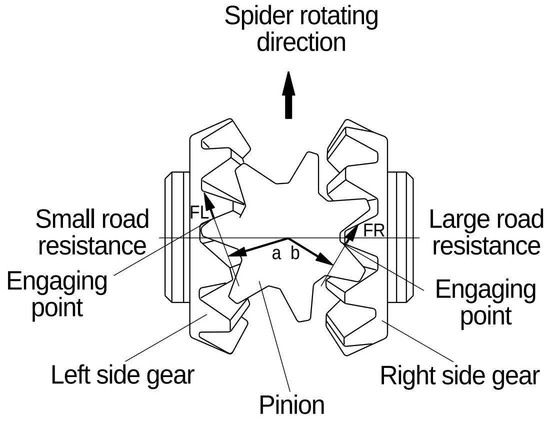


② **When traveling on soft ground**

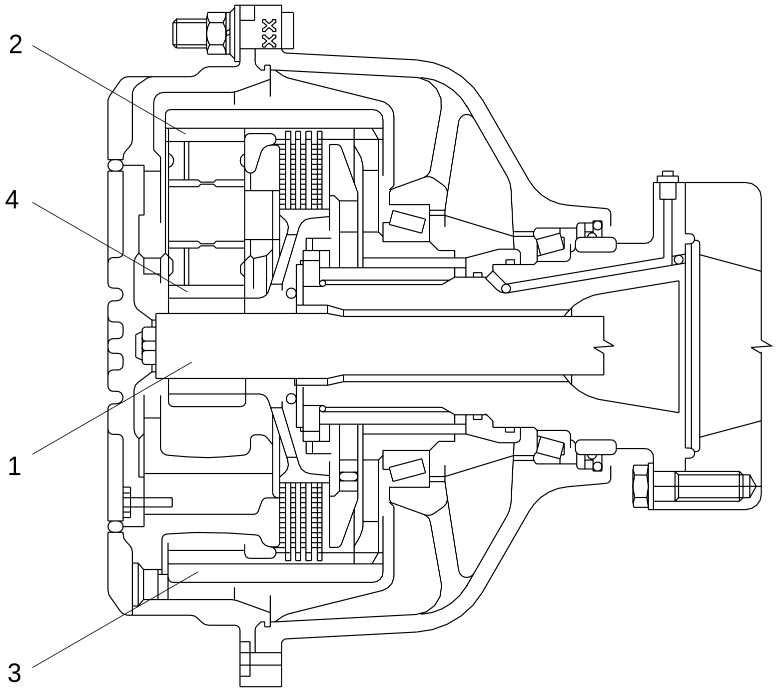
(Resistance from road surface to left and right tires is different)

If the road resistance to the left wheel is smaller, the left side gear tends to rotate forward, and this rotation changes the engaging points between the side gears and pinion. As a result, the distances involving the engaging points becomes a>b. The pinion now is balanced as FL × a=FR × b, where FL>FR. The right side gear is driven with a greater force than the left side gear. The torque can be increased by up to about 30% for either side gear.

The pinion therefore does not run idle and driving power is transmitted to both side gears until the difference between road resistance to the right and left wheels reaches about 30%.



6) **FINAL DRIVE**(Front & rear)

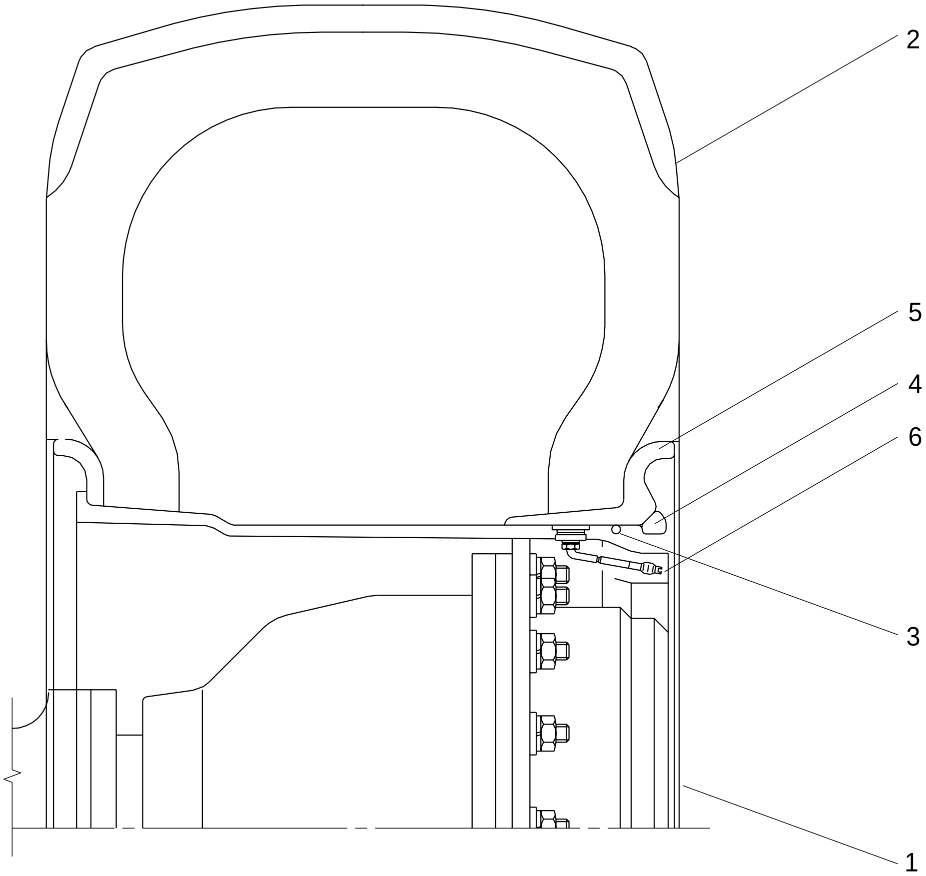


1	Axle shaft	3	Ring gear	4	Sun gear
2	Planetary gear				

(1) To gain a large drive force, the final drive uses a planetary gear system to reduce the speed and send drive force to the tires.

(2) The power transmitted from the differential through axle shaft(1) to sun gear(4) is transmitted to planetary gear(2). The planetary gear rotates around the inside of a fixed ring gear(3) and in this way transmits rotation at a reduced speed to the planetary carrier.
This power is then sent to the wheels which are installed to the planetary carriers.

5. TIRE AND WHEEL



1	Wheel rim	3	O-ring	5	Side ring
2	Tire	4	Lock ring	6	Valve assembly

1) The tire acts to absorb the shock from the ground surface to the machine, and at the same time they must rotate in contact with the ground to gain the power which drives the machine.

2) Various types of tires are available to suit the purpose. Therefore it is very important to select the correct tires for the type of work and bucket capacity.