

Under development  
Patent pending

# Clutch for Parking Lock System



## What is a Parking Lock system?

When the shift lever of a vehicle is placed into the park position, the Parking Lock system locks the rotation of the transmission or e-Axle to prevent the wheels from turning.

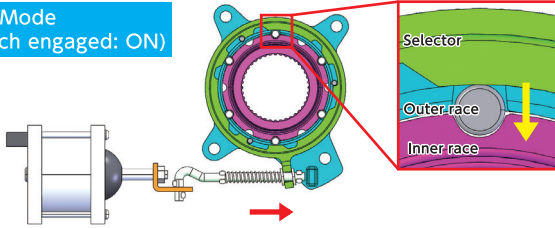
## Mechanism

The system is composed of the Inner race, Outer race, Selector, Rollers, and Spring.

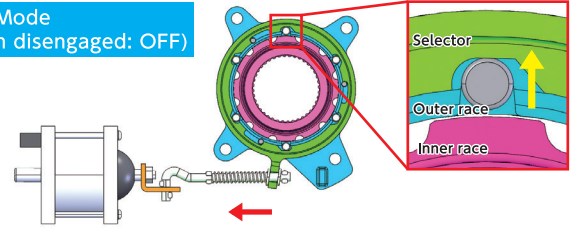
The clutch has ON/OFF functions which are switched by controlling the roller position with a selector.

The clutch, actuated by a combination of actuator and rod, allows simple mode switching between "Park Mode (Clutch engaged: ON)" and "Drive Mode (Clutch disengaged: OFF)". Additionally, a spring built into the actuator rod acts to ensure complete engagement of the Parking Lock system, thereby eliminating the problem of partial engagement.

**Park Mode**  
(Clutch engaged: ON)



**Drive Mode**  
(Clutch disengaged: OFF)



## Special Features

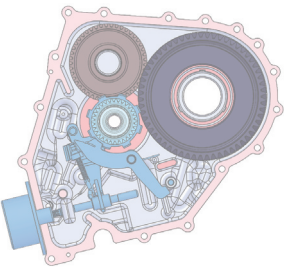
### 1. Beneficial functions of Parking Lock system are integrated into the compact clutch unit

- Reliable lock with high stiffness and fast engagement speed.
- No friction due to non-contact operation in the free mode.
- Smooth engagement even if torque is applied, such as when the vehicle is stopped on a slope.
- Safety functions to prevent sudden locking due to misuse.

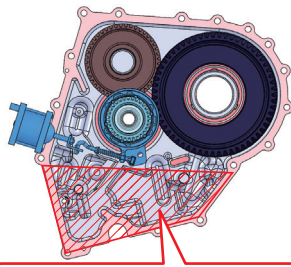
### 2. Reduction in the number of parts and miniaturization by making the clutch part a coaxial unit

Features	Benefit for customers
★25% Space saving	: Compact design and lighter weight
★70% Fewer parts	: Easy installation and shorter assembly time
★75% Reduction in machining	: Case/Housing cost reduction

E.g. Current Parking Lock system

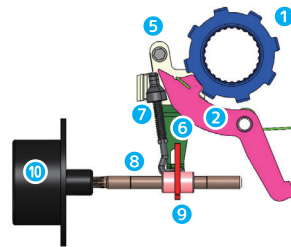


E.g. New Parking Lock system with Tsubaki clutch



Contributing to 25% space saving

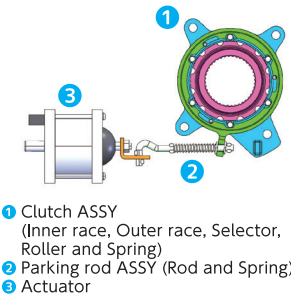
## Current Parking Lock system



- 1 Parking gear
- 2 Parking pawl
- 3 Return spring
- 4 Fulcrum pin
- 5 Guide bushing
- 6 Position retaining flat spring
- 7 Parking rod ASSY (Rod, Spring, and Cone)
- 8 Actuator shaft ASSY (Shaft, Spring pin, and Plate)
- 9 Manual plate
- 10 Actuator



## New Parking Lock system with Tsubaki clutch



### Clutch

- Standby spring integrated type

### Fixture

- Spline
- Bolt fixing

### Actuator

- Linear actuator
- Rotating actuator
- Worm gear etc

Miniaturization, weight reduction, and cost reduction

Customized solutions

The Tsubaki Clutch contributes to the improvement of energy-saving performance in the electrification of automobiles by making No.1 more reliable, long-lasting, and compact.

## TSUBAKIMOTO CHAIN CO.

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Description



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# Roller ratchet type selectable clutch

## What is a Roller Ratchet Selectable Clutch?

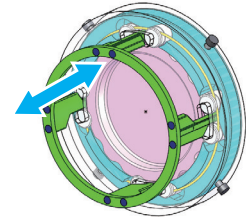
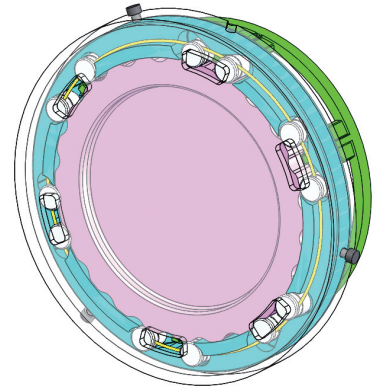
It is an externally actuated clutch that can hold torque or freewheel in one or both directions, depending on the mode of operation. This is accomplished by adjusting the position of internal rollers to achieve the various modes. Modes include 2way lock, 2way free, and 1way mode (CW/CCW).

## Special Features

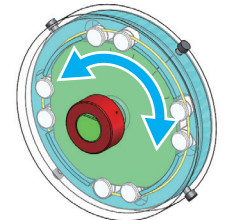
The best combination for your application is possible

High stiffness, compact design, and addition of a torque limiter function can be achieved.

	Function			Body size	Torque limiter expandability
	2way lock (Stiffness)	1way lock/free (Switching shock)	2way free (Drag torque)		
Roller Ratchet Selectable Clutch	+++	++	+++	+++	++ Option
Cam Selectable Clutch	++	+++	+++	++	++ Option
Dog Clutch	+++	+ No 1way mode	+++	+++	+
Multi-plate Clutch	+++	+++	+ High drag torque	+ Large size	++



Axial selector

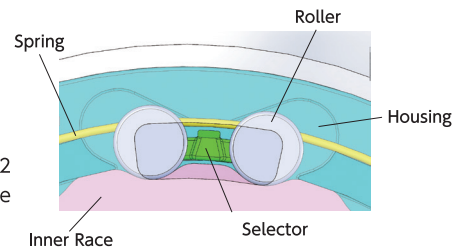


Rotary selector

## Mechanism

### Simple structure

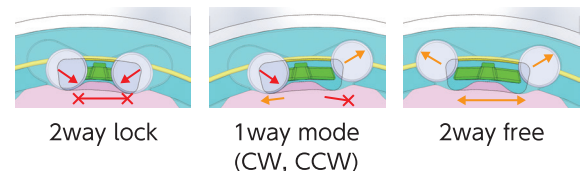
Roller position is controlled by a selector to switch between locked and free. 2 way free operation is attained by the selector pushing the rollers away from the inner race. Axial or rotary selectors are possible.



## Advantages

### Miniaturization, cost reduction, and energy efficiency

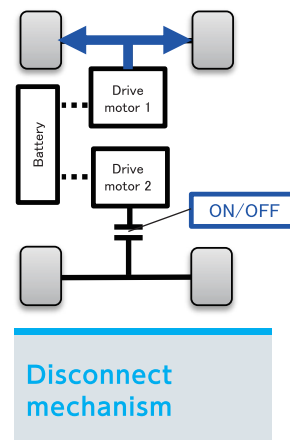
We will provide the most suitable selectable clutch to suit your application. This will help you make your products smaller, less expensive, and more energy efficient.



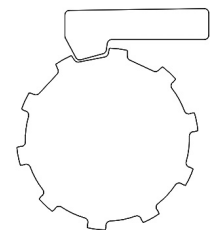
## Application Proposal

### Replacement of Dog Clutch and Multi-plate Clutch

The Roller Ratchet Selectable Clutch can offer a seamless ON/OFF because of one way mode capability in comparison to Dog Clutches and Multi-plate Clutches. It can accomplish the same task with less peripheral devices than Multi-plate Clutches. It is suited for an application which requires high torsional rigidity and compact.



Disconnect mechanism



Parking Lock system

The Tsubaki Clutch contributes to the improvement of energy-saving performance in the electrification of automobiles by making No.1 more reliable, long-lasting, and compact.

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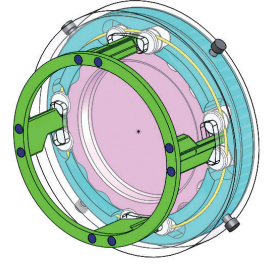
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Element under development  
(~March 2024)

# Torque Limiter Clutch

## What is a Torque Limiter Clutch?

This clutch provides a torque limiter function in addition to the normal one-way clutch functionality, thereby realizing the integration of necessary torque transmission and overload protection in one package.



## Special Features

Optimal combination can be selected according to the application

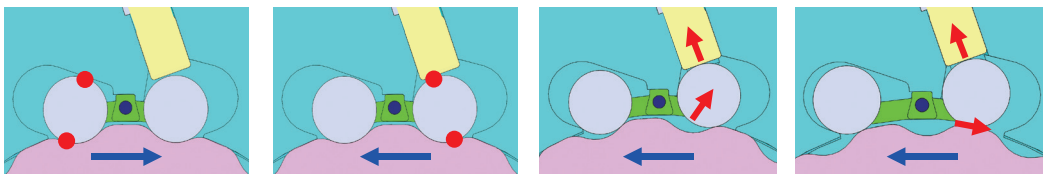
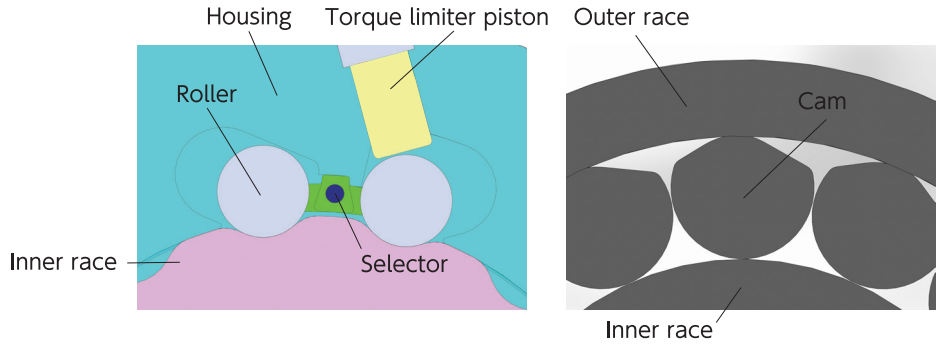
Torque limiter can be adjusted in forward or reverse rotation. Limit and load size can be set freely.

## Mechanism

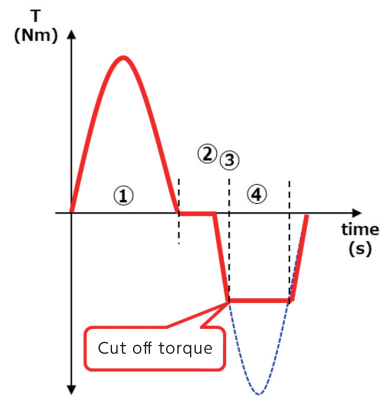
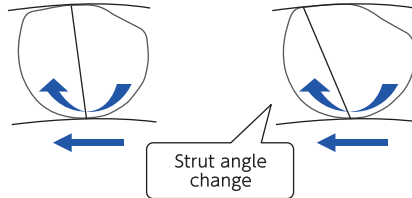
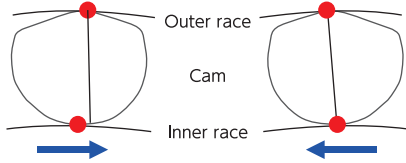
Simple and highly functional structure

**Roller ratchet** ... When the set torque is exceeded, the torque limiter piston is lifted to release the excess torque.

**Cam type** ... Structure that relieves excess torque by the design of the cam shape and the position of the strut angle



① Torque transmission (Forward)    ② Torque transmission (Reverse)    ③ Excessive torque input    ④ Torque release



## Advantages

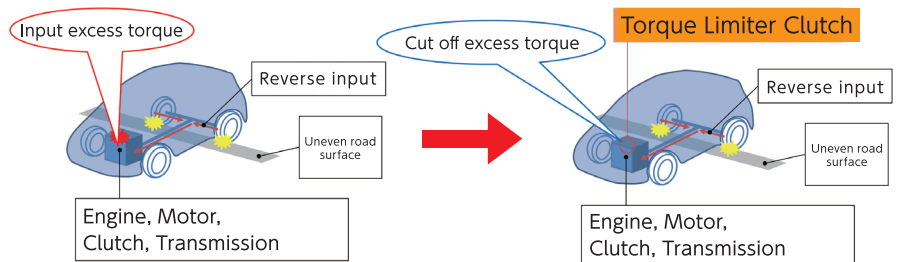
Miniaturization, cost reduction, and energy efficiency

In addition to high functionality, this high-torque, space-saving clutch enables unit configurations that could not be realized before. This enables customers to make their products smaller, less expensive, and more energy efficient.

## Application Proposal

e-Axle drive unit

Limits the impact load from tires, such as when driving on bad roads, and contributes to the downsizing of each component thus reducing the size of the entire drive unit.



The Tsubaki Clutch contributes to the improvement of energy-saving performance in the electrification of automobiles by making No.1 more reliable, long-lasting, and compact.

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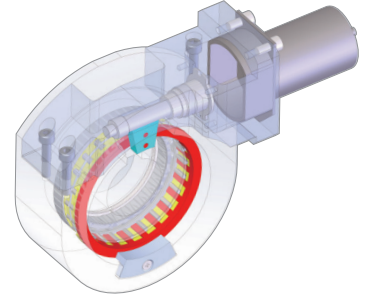
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Under development  
Patent pending

## 2x Modes Cam Selectable Clutch

### What is a 2x Modes Cam Selectable Clutch?

This clutch controls the attitude of the cam from the outside and realizes several operating modes from among 2way lock mode, 2way free mode, and 1way lock mode (CW/CCW).



### Special Features

Optimal combination can be selected according to the application

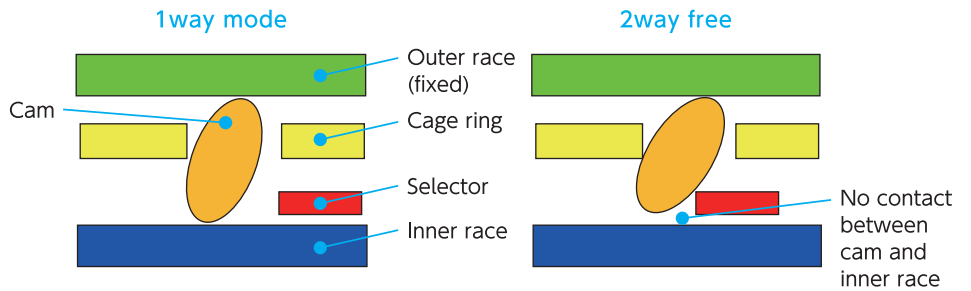
A cam type selectable clutch is combined with a cam angle control mechanism selector in this basic one-way clutch. It can be used in two modes: 2way free and 1way (CW/CCW).

Type	2way lock	2way free	1way mode (CW)	1way mode (CCW)	Inner and outer race rotation	Operation direction at switching
4x modes Cam Selectable Clutch	++	++	++	++	++	Axial direction
2x modes Cam Selectable Clutch	+	++	++ (+)	+ (++)	+ Fixed Shaft	Rotary direction

### Mechanism

#### Simple structure

Cam position is controlled by a selector to switch between 2way free and 1way mode. This is achieved by a simple mechanism in which the cam is moved out of contact with the inner race (or outer race) by means of the selector pushing the cam, resulting in 2way free.



### Advantages

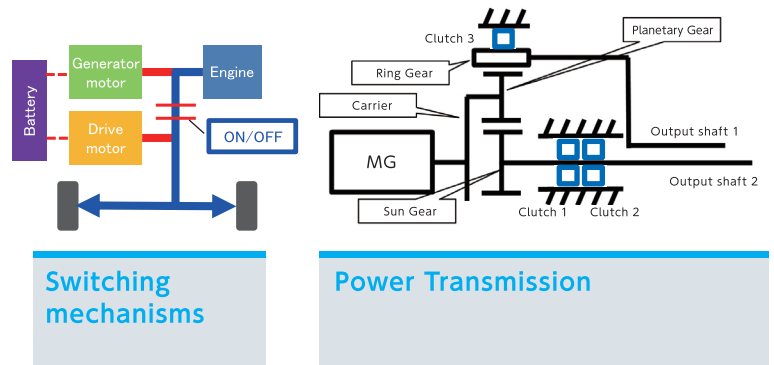
#### Miniaturization, cost reduction, and energy efficiency

We will propose the most suitable selectable clutch design and quantity to suit your application. This will help you make your products smaller, less expensive, and more energy efficient.

### Application Proposal

#### Replacement of Dog Clutch and Multi-plate Clutch

Compared with the Dog Clutch, this Cam Selectable Clutch provides seamless operation. In addition, the Cam Selectable Clutch enables us to reduce the number of peripheral devices compared to the Multi-plate Clutch (the control mechanism will change). In particular, it is suitable for seamless switching mechanisms (shift mechanism/power switching) that utilize 1way mode.



The Tsubaki Clutch contributes to the improvement of energy-saving performance in the electrification of automobiles by making No.1 more reliable, long-lasting, and compact.

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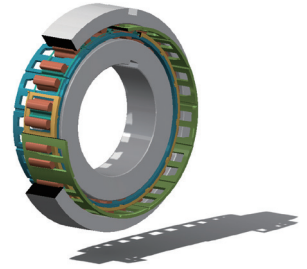


Under development  
Patent pending

# 4x Modes Cam Selectable Clutch

## What is a 4x Modes Cam Selectable Clutch?

It is an externally actuated clutch that can hold torque or freewheel in one or both directions, depending upon the mode of operation. This is accomplished by controlling the attitude of the cams to achieve the various modes. Modes include 2way lock, 2way free, and 1way(CW/CCW).

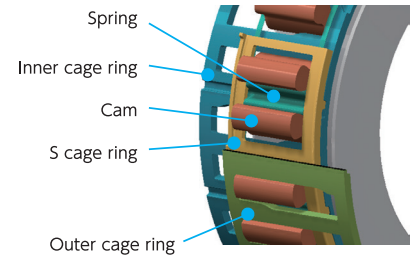


## Special Features

### All meshing 4x modes in a single unit

This cam type selectable clutch utilizes two sets of opposing cams which operate in two axial directions by means of the "Inner cage ring" and "Outer cage ring". It enables us to achieve all modes, 2way lock, 2way free, and 1way (CW/CCW) modes with a single clutch.

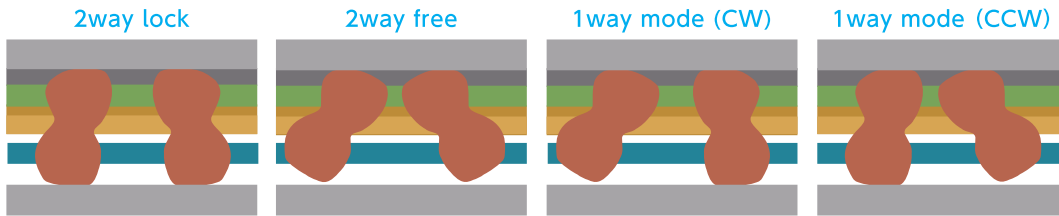
Type	2way lock	2way free	1way mode (CW)	1way mode (CCW)	Inner and outer race rotation	Operation direction at switching
4x modes Cam Selectable Clutch	++	++	++	++	++	Axial direction
2x modes Cam Selectable Clutch	+	++	++(+)	+(++)	+ Fixed Shaft	Rotary direction



## Mechanism

### Simple and highly functional structure

This newly developed structure achieves unprecedented high functionality with a simple mechanism. This enables us to provide compact products with high functionality and torque.



## Advantages

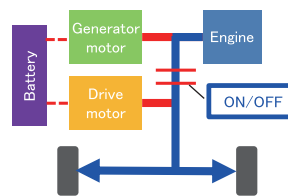
### Miniaturization, cost reduction, and energy efficiency

In addition to high functionality, this design with high torque response and compact size enables a unit configuration that could not be realized until now. This allows customers to make their products smaller, less expensive, and more energy efficient.

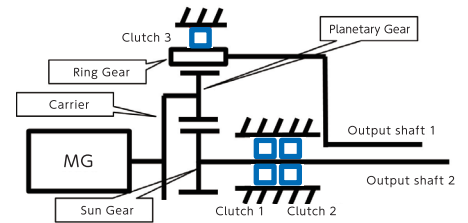
## Application Proposal

### Replacement of Dog Clutch and Multi-plate Clutch

Compared with the Dog Clutch, this Cam Selectable Clutch provides seamless operation. In addition, Cam Selectable Clutch enables us to reduce the number of peripheral devices compared to the Multi-plate Clutch (the control mechanism will change). In particular, it is suitable for seamless switching mechanisms (shift mechanism/power switching) that utilize 1way mode.



Switching mechanisms



Power Transmission

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