

ENHANCEMENT OF PRODUCT APPEAL

■ SEAT BELT

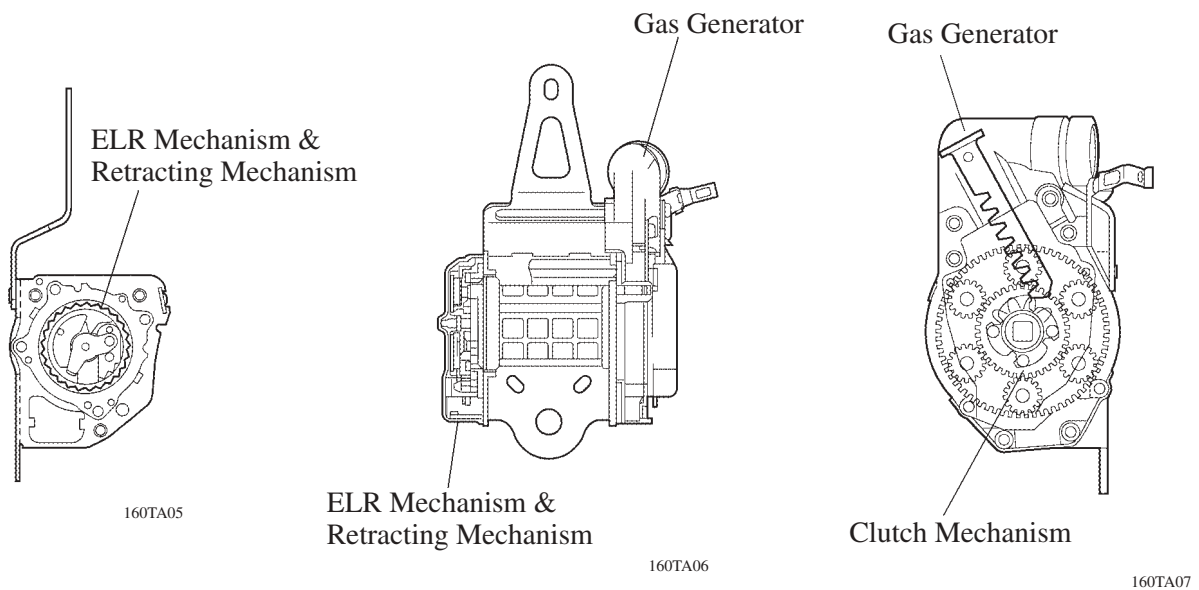
1. General

- The front seats are provided with an electrical sensing type seat belt pretensioner and a seat belt force limiter. In the beginning of a collision, the seat belt pretensioner instantly pulls up the seat belt thus providing the excellent belt's effectiveness in restraining the occupant.
When the impact of a collision causes the tension of the seat belt applied to the occupant to reach a predetermined level, the force limiter restrains the tension, thus controlling the force applied to the occupant's chest area.
- In accordance with the ignition signal from the airbag sensor assembly, the seat belt pretensioner activates simultaneously with the deployment of the SRS airbags for the driver and front passenger.

2. Seat Belt Pretensioner

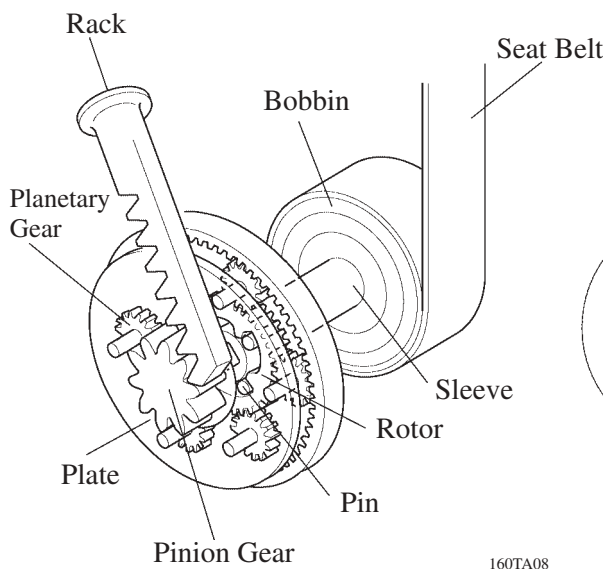
Description

The seat belt pretensioner consists of the ELR (Emergency Locking Retractor) mechanism, pretensioner mechanism, retracting mechanism and force limiter mechanism.

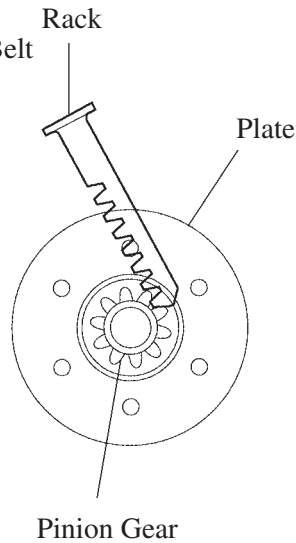


Construction

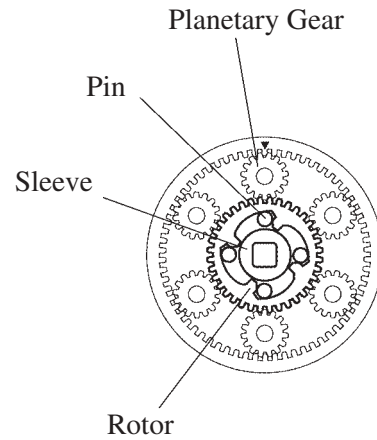
- The pretensioner mechanism consists of a rack, planetary gear assembly, rotor, pin, sleeve and etc.
- The shaft for the pinion gear, plate, and planetary gears has an integral construction.
- The in-and-out movement of the seat belt and the rotation of the sleeve occur in unison because the seat belt and the bobbin are fitted to the sleeve.



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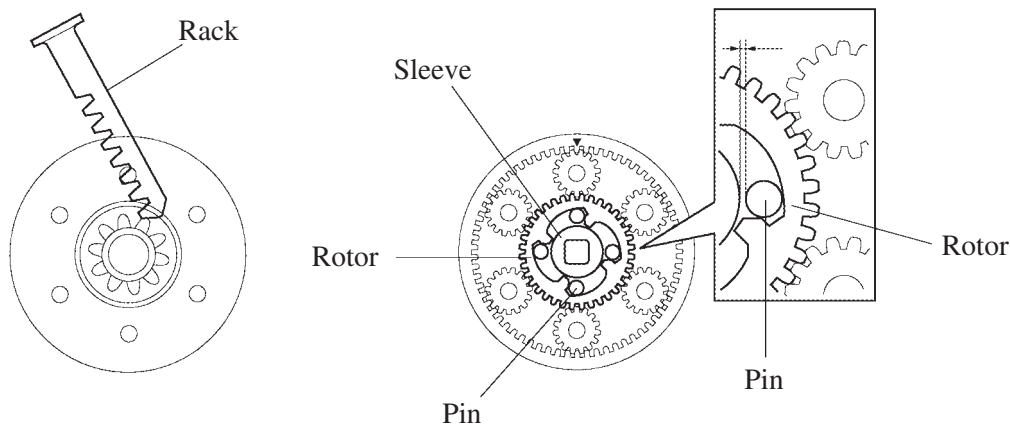
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Operation

1) Pretensioner inactive (normal state)

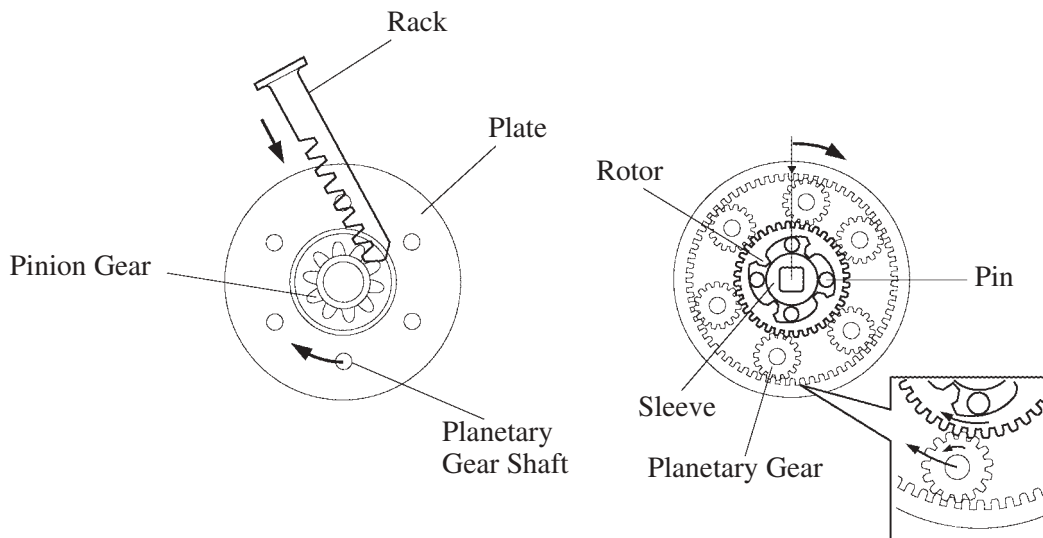
A clearance is provided between the sleeve and the pin, thus allowing the sleeve to rotate freely. As a result, the belt can move in-and-out.



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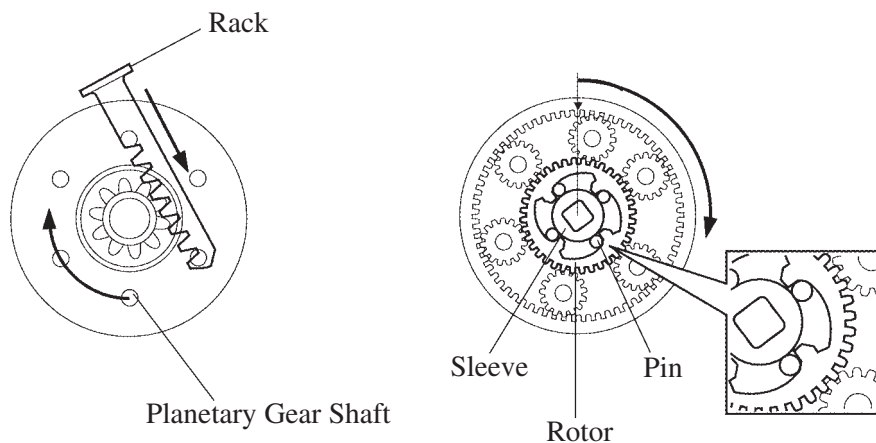
2) Pretensioner activated

- If the airbag sensor is activated by the deceleration of a frontal collision, the electric current ignites the gas generator located in the pretensioner. As a result, the gas generator emits gas in an extremely short time, thus pushing the rack down.
- The downward movement of the rack, which has been prompted by the activation of the gas generator, causes the pinion gear, plate, and the planetary gear shaft to start rotating. The rotation of the shaft causes the planetary gears to rotate counterclockwise; then, the rotor, which meshes with the planetary gears, rotates clockwise. This rotation of the rotor then eliminates the clearance between the pin and the sleeve.



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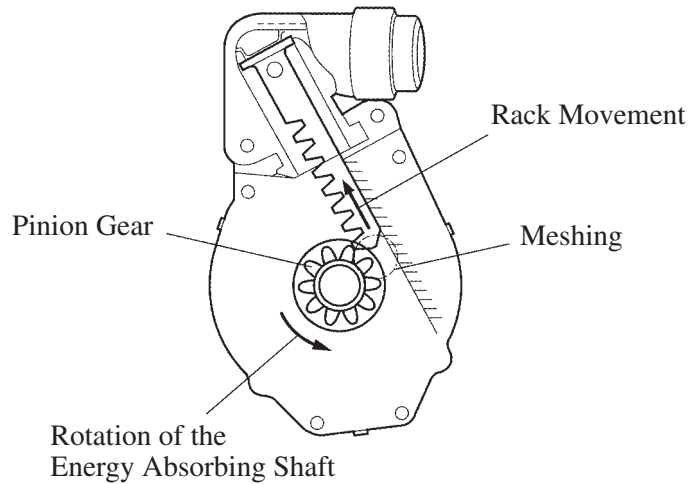
- As the rack moves further and the planetary gear shafts continue to rotate, the pin meshes between the rotor and the sleeve. As a result, the rotor and the sleeve rotate in unison.



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3) Force Limiter Activated

When the activation of the force limiter creates torsion in the energy absorbing shaft, the sleeve that is fitted to the energy absorbing shaft starts to rotate counterclockwise, which is opposite to when the pretensioner was activated. The rotor, planetary gears, plate, and the pinion gear (which became unified with the sleeve at the time the pretensioner was activated) rotate simultaneously, causing the rack to be pushed upward to the position before the pretensioner was activated. Consequently, the pinion gear and the rack become disengaged, allowing the pinion gear to move freely. As a result, the force limiter continues to operate.

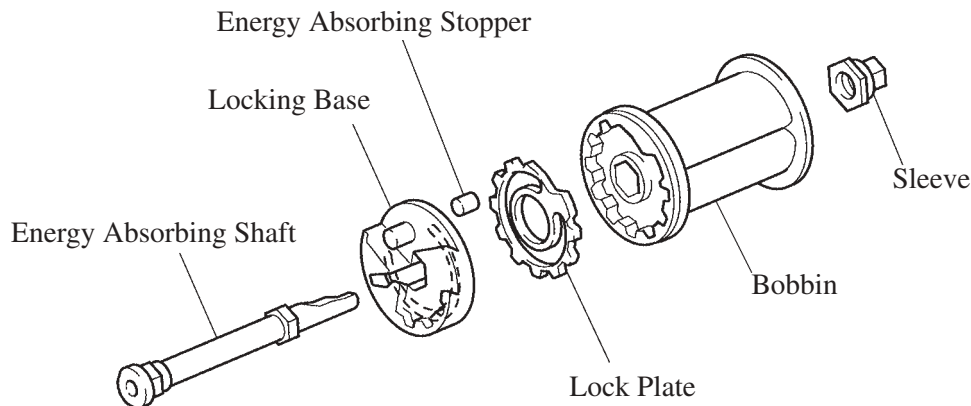


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3. Seat Belt Force Limiter

Construction

- The seat belt force limiter consists of a bobbin, energy absorbing shaft, locking base, energy absorbing stopper, lock plate, etc.
- The end of the energy absorbing shaft is fitted to the bobbin. Also, the lock plate is fitted to the bobbin.
- The energy absorbing stopper is fitted into the groove that is provided in the locking base and the lock plate. Ordinarily, the stopper is secured by the claw to the end of the groove in the lock plate.

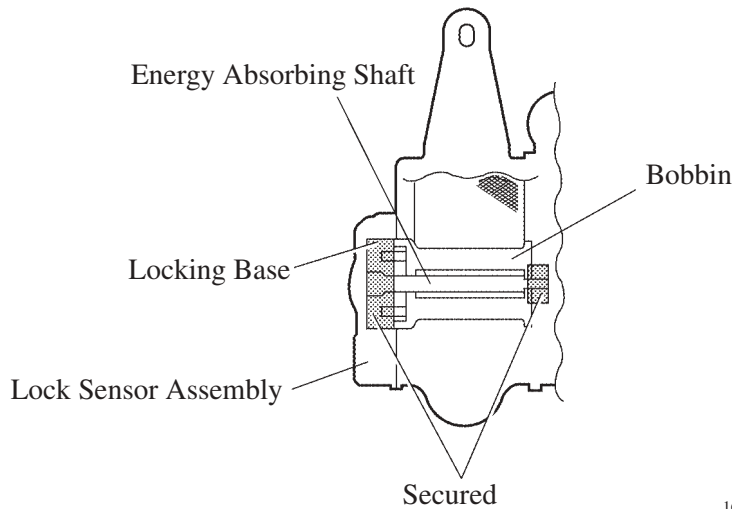


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Operation

1) Beginning of Activation

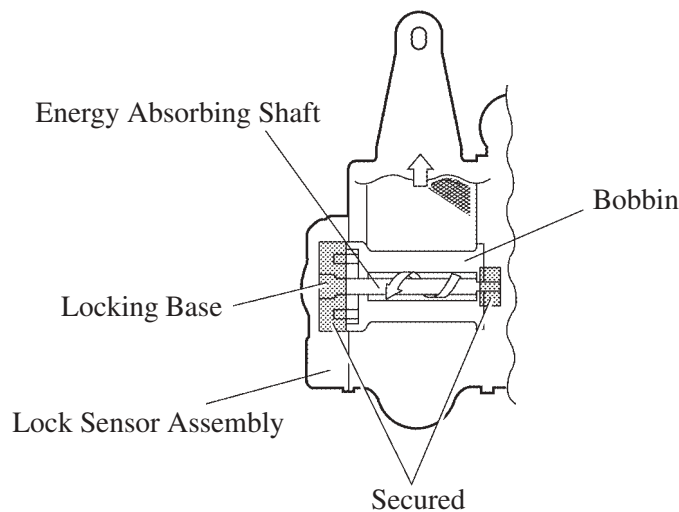
When the seat belt is pulled out at an acceleration rate that is higher than the specified rate, the ELR (Emergency Locking Retractor) mechanism activates, enabling the lock sensor assembly to lock the energy absorbing shaft to the locking base. Because the bobbin is fitted to side of the energy absorbing shaft that is opposite to the side that is fitted with the lock sensor assembly, the bobbin will not be able to rotate. As a result, the seat belt, which is wound around the bobbin, cannot be pulled out.



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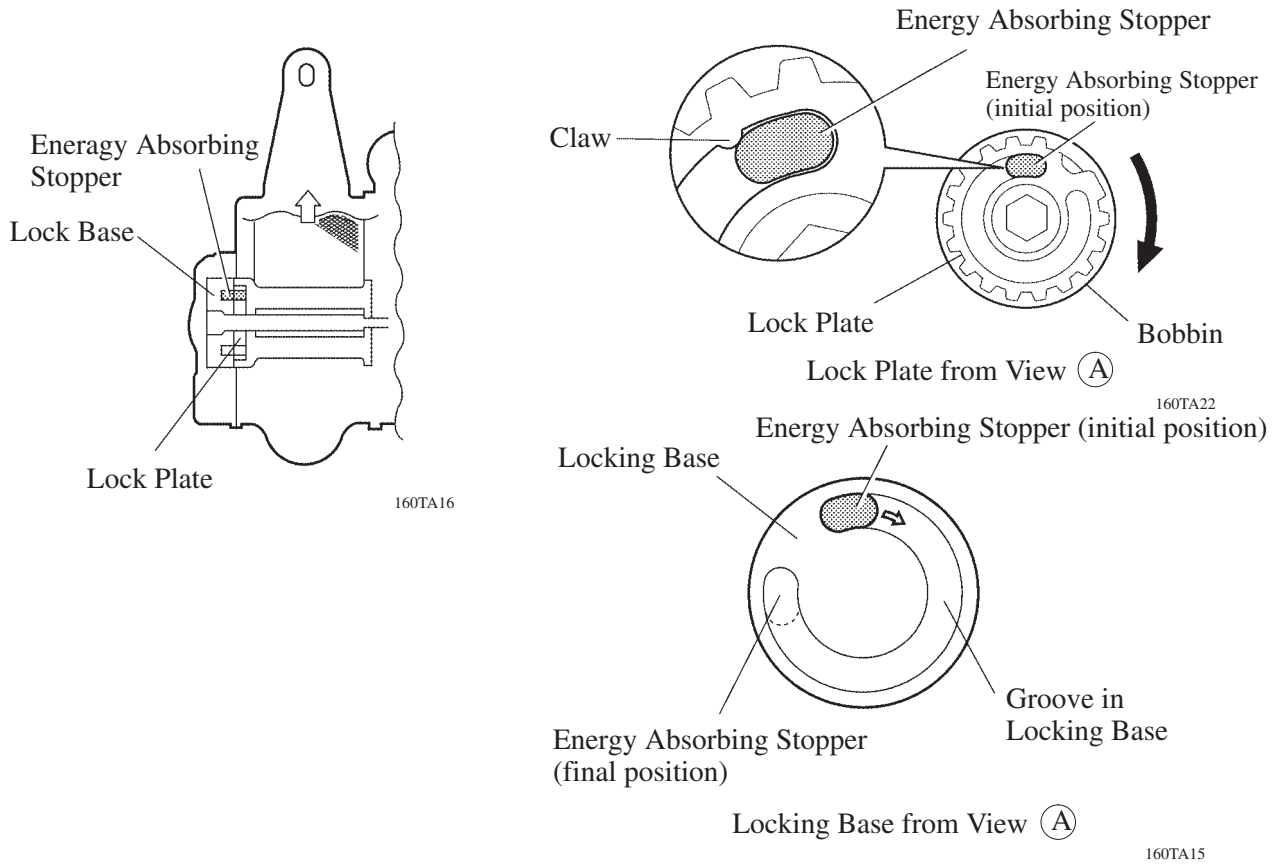
2) During Activation

- If a load that is greater than the specified load is applied to the seat belt while the ELR mechanism is activated, the bobbin to which the seat belt is attached attempts to rotate. However, because the energy absorbing shaft that is fitted to the bobbin is locked by the lock sensor assembly, torsion is created in the energy absorbing shaft. This torsion of the energy absorbing shaft rotates the bobbin, allowing the seat belt to be pulled out. In addition, the torsion of the energy absorbing shaft acts as a resistance against the pulling out of the seat belt.



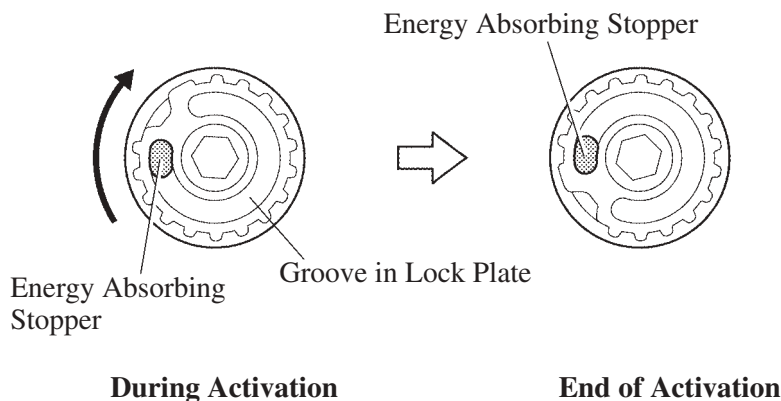
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- As the seat belt is pulled out and the bobbin rotates, the lock plate that is fitted to the bobbin rotates. At this time, because the energy absorbing stopper that is fitted in the groove of the lock plate is secured by the claw, the stopper rotates in unison with the lock plate along the groove of the locking base and stops at the end of the groove.



3) End of Activation

When the rotation of the energy absorbing stopper stops at the end of the groove in the locking base, the rotation of the bobbin that results from the pulling out of the seat belt causes the claw to disengage from the lock plate. Accordingly, the bobbin and the lock plate continue their rotation. Then, the end of the groove in the lock plate comes in contact with the stopper, causing the rotation to end. As a result, the lock plate and the bobbin will not be able to rotate, thus ending the activation of the force limiter.



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