Change in bearing 500 years

Autonomous Decentralized Bearing

Main patents (Issued)

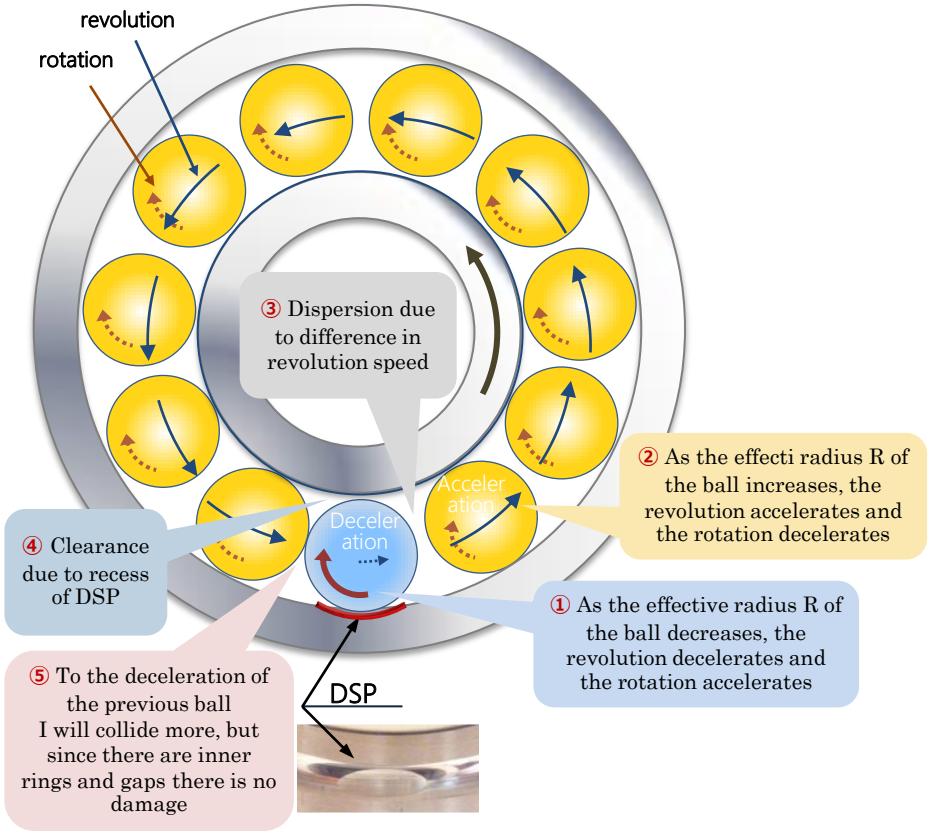
1) US8052330 JP3964926
2) US8783958 CNZL200880015918 JP5320547

Coo Space CO.,LTD.

http://www.coo-space.com

How it works

Bearings with non-contacting balls without retainer



In place of the cage, ADB has one to several Dispersion Starting Points (DSP recesses) on the outer ring. By moving the contact point between the ball and the outer ring [O in the figure] from the groove bottom of the outer ring to the two recesses of the recess, the effective radius R of the ball is decreased (see the figure below).
This decrease in R will change the ratio of ball self-revolution (left figure).

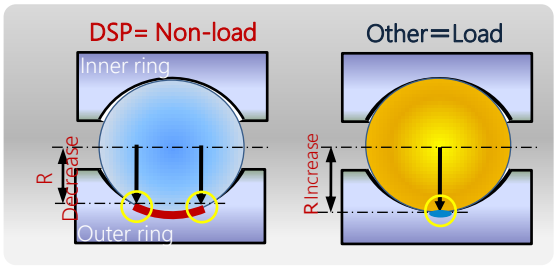
① When a ball enters the DSP, the revolution of the ball decelerates and the rotation accelerates, and

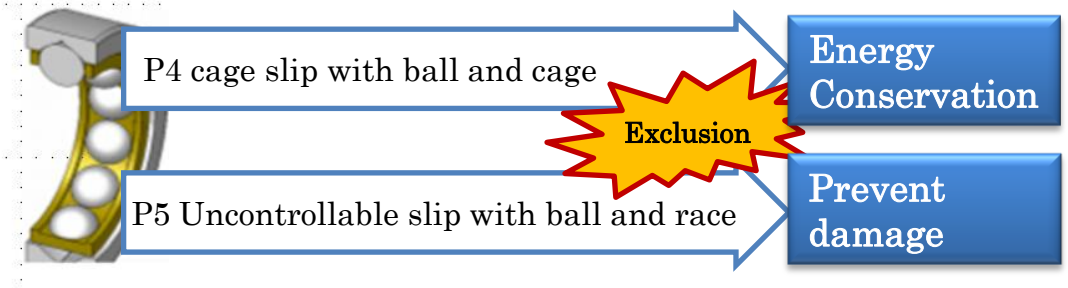
② when escaping from this point, the revolution accelerates instead of decelerating the accelerated rotation, and

③ disperses the ball with the succeeding ball I will.

④ Since the DSP is digging down the groove bottom of the outer ring, there is a gap between the ball passing through here and the inner ring.

⑤ The ball of the DSP may be rear-ended from the succeeding ball due to the deceleration of the revolution, but because it is an unloaded ball by ④, it will not be damaged because it is easily extruded even if it is rear-ended.

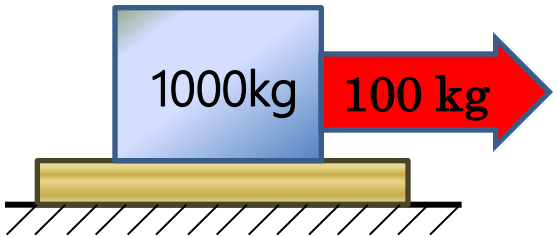




What is the cage slip → Main factor of friction loss

Sliding

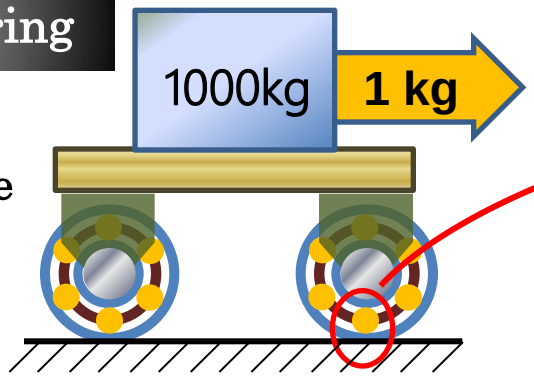
Coefficient of friction μ about 0.1

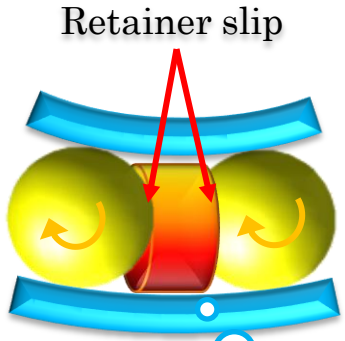


Friction of rolling bearings is 50 times or more of rolling friction!

Rolling bearing

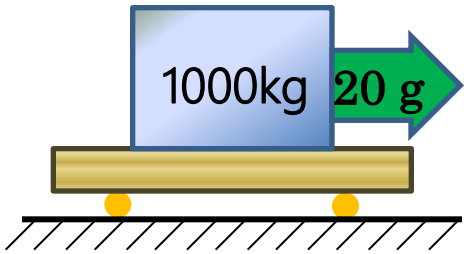
μ>0.001 Catalog value





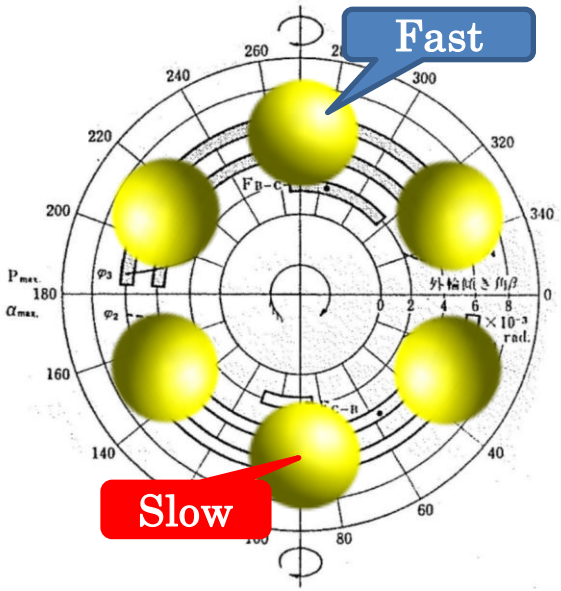
Rolling

μ=0.00002 Mechanical Engineering Handbook The Japan Society of Mechanical Engineers

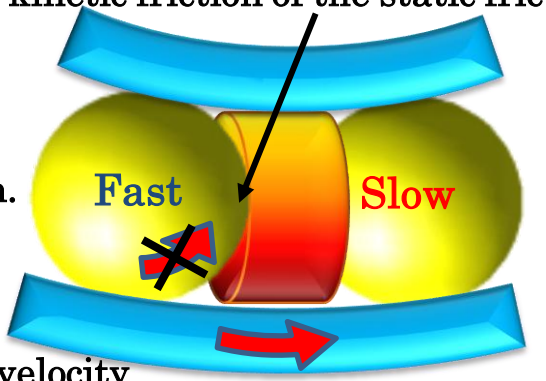


What is the Uncontrollable slip

Cause of Bearing Failure



Friction increases so that slipping respect of Ball and the retainer may take the place from the kinetic friction of the static friction.

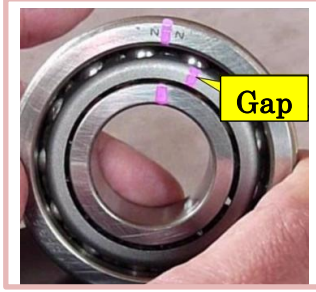


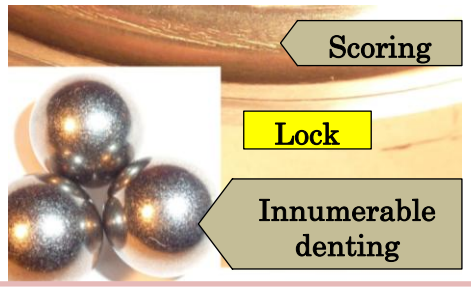
Stop of Balls rotation.

It slips to cancel the velocity differential between the Ball and the race.

It falls into slipping that cannot be controlled because the static friction of the retainer is larger than the kinetic friction of race.

The revolution speed of the balls that receives the moment varies. Dr. Kazuo Tsunoda The Japan Society of Mechanical Engineers 32-239 (1966)

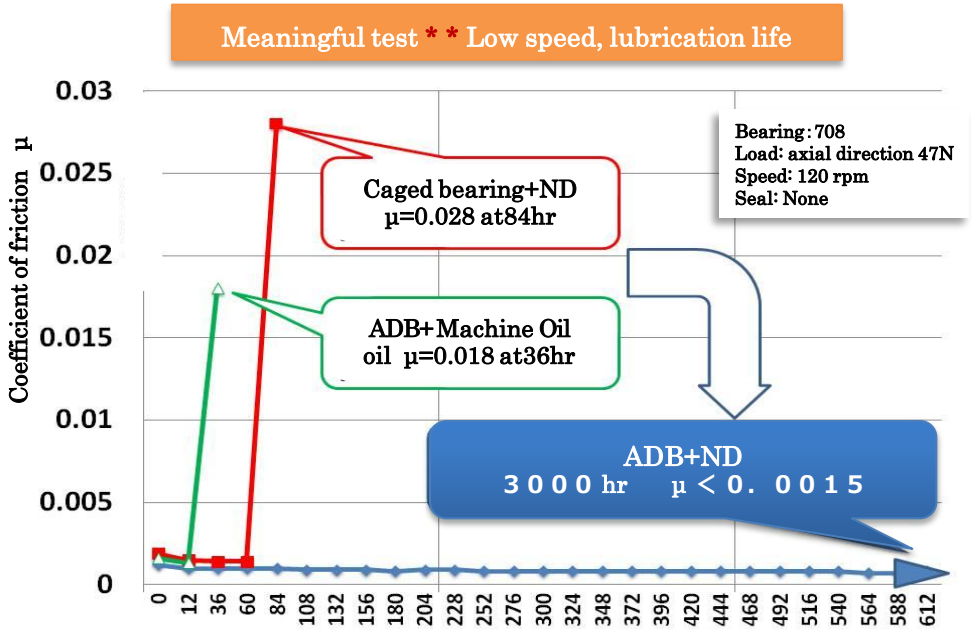




Nano Diamond*

Convert differential slip to rolling motion

* 1 / 100,000 mm diamond particles dispersed in machine oil, ADB recommended individual lubricant.

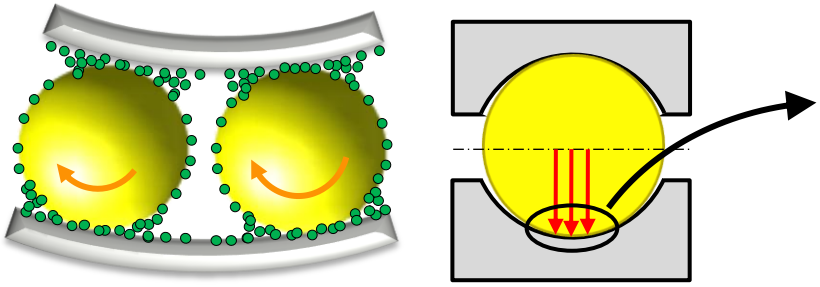


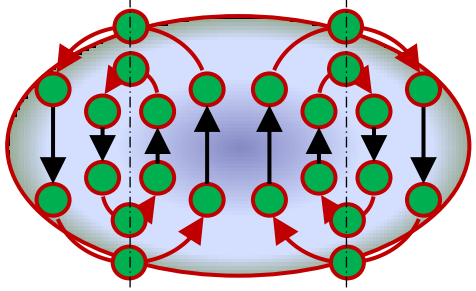
** This test is a low-speed test in which the ball dispersion of ADB becomes insufficient.

The Nano Diamond oil film presents an iris. Replenishment, disappearance of the iris, or torque Rise to twice the initial value, please use as a guide.

Nano Diamond on the rolling contact surface, along the slip Schematic diagram that circulates and relieves shear stress ***

Since there is no cage, the Nano Diamond is not eliminated and it stays long on the rolling surface.





***It is estimated from the long lubrication life, It is not what was confirmed.

Unique performance of ADB

Dramatic solution that does not rely on lubrication

Degreasing, water lubrication

Allowing tilt (moment)

No lubrication in flame

Effect

The ball is not restrained

- Minimum friction → Efficiency gain
- Minimum friction → Improvements of Smearing etc
- Static friction = Dynamic friction → Positioning accuracy improvement
- Decrease in wear-out → Extension of lubrication longevity
- Decrease in generation of heat → Decrease in thermal deformation

Retainer exclusion

- Increase in number of balls → Load capacity increase /miniaturization
- Retainer exclusion → Cost reduction
- Liberating from restriction by retainer material → Environment-proof of performance improvement

Use "Energy saving" and "Damage resolution"