

Product Introduction of Compact Torque Diode (TDL8)



Masayuki OHARA *

NTN manufactures a “torque diode” that transmits rotation torque from the input shaft to the output shaft. But does not transmit the torque from the output shaft, which is the reverse input, to the input shaft. This article introduces the technology of the compact and lightweight torque diode “TDL8” which has an outer ring diameter of 1/3 (10 mm) and a weight of 1/14 (5 g) as compared with conventional product “TDL28”.

1. Introduction

NTN produces a torque diode used in reverse input prevention mechanisms and drop prevention mechanisms. This product is used between two power transmission shafts such as a motor and transmission. This is a reverse input blocking clutch that transmits the running torque from the input shaft to the output shaft and locks the running torque from the output shaft, preventing it from being transmitted to the input shaft. Due to this ability, it has been given the name “torque + diode” from the rectifying action of the torque. Since it does not require electric power when compared with an electromagnetic brake, this enables energy to be saved at mounted machinery. It is also unaffected by power outages which is an excellent safety feature. The torque diode (hereafter, TDL) is introduced below (Fig. 1).

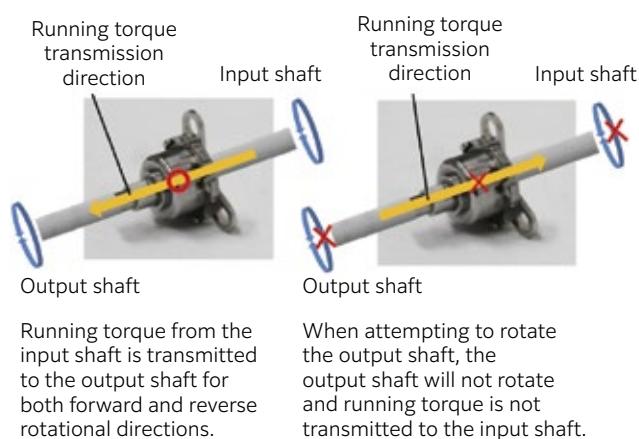


Fig. 1 TDL function

2. Torque diode structure and features

TDL comprises an outer ring, inner ring, cage, rollers, spring and side plate, and is used with an input shaft prepared by the user (Fig. 2). The running torque of the input shaft is transmitted to the output shaft integrated with the inner ring (hereafter, output shaft). The rollers and spring lock the output shaft when the input shaft is not rotating to block reverse input.

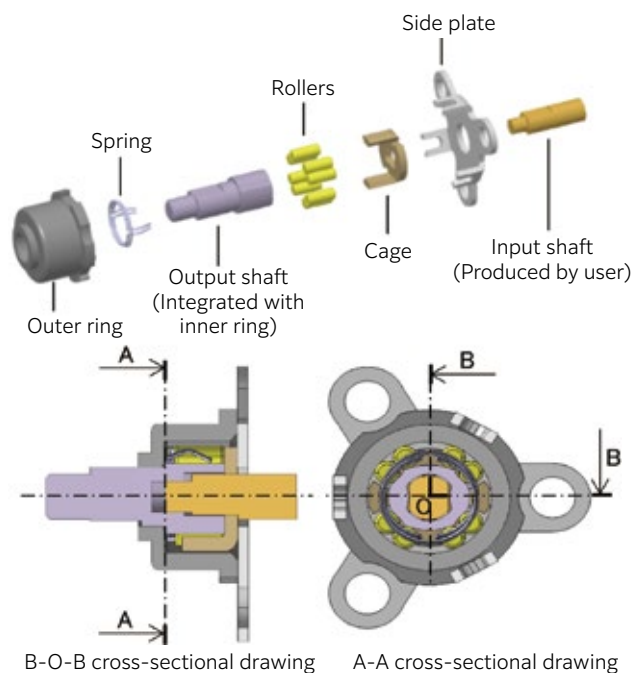


Fig. 2 TDL structure

* Product Design Dept., Industrial Business Headquarters

3. Operating principle

This section explains the operating principle of how TDL transmits running torque from the input shaft to the output shaft. It also uses a structural drawing of a conventional product "TDL28" to show how the rollers lock the output shaft (Fig. 3).

When the input shaft is motionless and not rotating, there is clearance between the input shaft and output shaft. The rollers are making contact with the outer ring bore diameter and the output shaft so there is no rotation (Fig. 3 (a)).

When the input shaft rotates from a motionless state, 1) the cage connected to the input shaft pushes the rollers to release the lock. Then 2) the input shaft and output shaft make contact, and 3) the output shaft rotates (Fig. 3 (b)).

When attempting to rotate from the output shaft, the spring pushes two rollers against a wedge formed by the outer ring bore diameter and output shaft cam surface. This locks rotation in both the forward and reverse directions and prevents the shaft from rotating (Fig. 3 (c)).

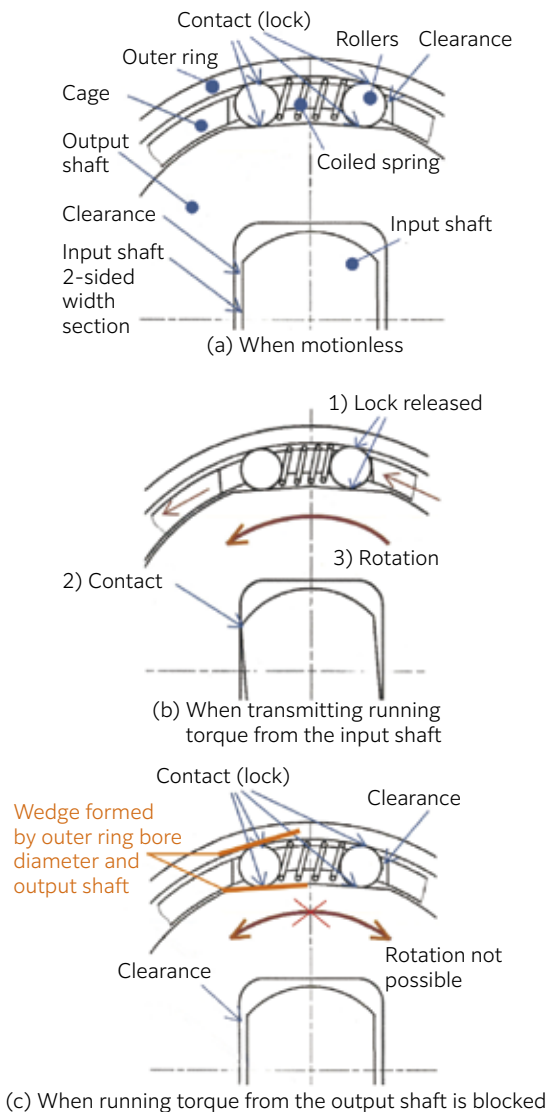


Fig. 3 TDL operating principle

4. TDL8 structure and features

Fig. 4 shows the structure of the compact and lightweight torque diode "TDL8". "TDL8" uses a proprietary shaped C-type spring that enables it to save more space than "TDL28", a conventional product that uses a coiled spring. This enables smaller rollers to be used because many rollers can be inserted. This achieves a 10 mm outer ring outer diameter that is 1/3 the size and a 5 g weight that is 1/14 that of the conventional product "TDL28", while still maintaining the allowable load torque.

The structure and features of the compact and lightweight torque diode "TDL8" are listed below against the conventional product "TDL28".

1. Changed from a coiled spring to a proprietary shaped C-type spring.
2. Many rollers are inserted, enabling smaller roller sizes, which reduces the overall size and weight of TDL.

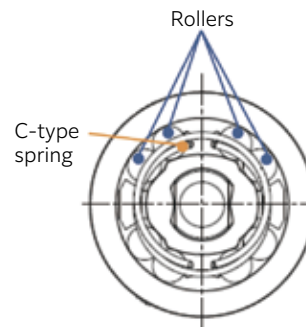


Fig. 4 TDL8 structure

5. Example of application

TDL is used in as applications like reverse input prevention mechanisms. This will prevent unintended rotation from the output shaft and drop prevention mechanisms (Fig. 5) for the purpose of maintaining safety when stopping rotation from the input shaft at the time of a power outage, etc.

It is also installed in automobile seat lifter mechanisms (Fig. 6). These systems are used to lift or lower an automobile seat surface by operating a lever when adjusting the height of the seat. It will also allow a user to maintain the height of the seat when not operating the lever.

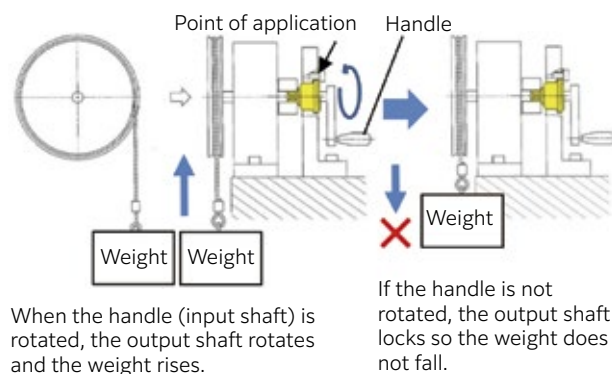
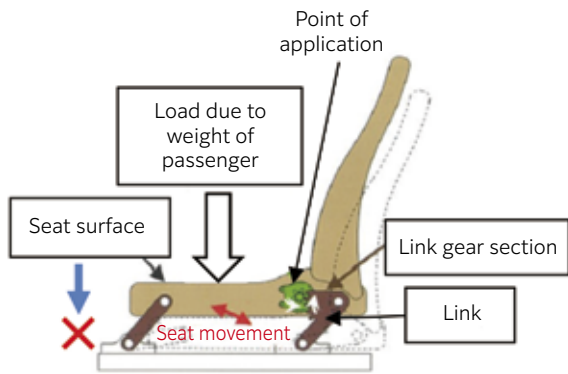


Fig. 5 Example of application in drop prevention mechanism



The torque diode prevents the link from falling over to maintain the seat position.

Fig. 6 Example of application on automobile seat

6. Summary

The compact and lightweight torque diode “TDL8” achieves a significantly smaller and lighter product in comparison with the conventional product “TDL28”, and is a product that contributes towards making mounted machinery smaller, lighter and require less energy.

In the future, **NTN** will continue to aim to make this product more compact, lightweight and provide higher efficiency, and also achieve a sustainable “NAMERAKA Society” by saving energy.

References

- 1) NTN Catalog Clutch Related Products CAT. No.6405/J.

Photo of author



Masayuki OHARA

Product Design
Dept.,
Industrial Business
Headquarters