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DISK GENERATOR INTEGRATED WITH FLYWHEEL, HYBRID POWERTRAIN, AND VEHICLE

Abstract

A disk generator integrated with a flywheel, a hybrid powertrain, and a vehicle. The disk generator includes the flywheel, a rotor, and a stator that are sequentially arranged adjacent to each other in an axial direction of the generator. The flywheel is configured to: be in transmission connection with an engine, and drive the rotor to rotate through a torsional vibration damper, and the torsional vibration damper includes a drive disk and a plurality of circumferential buffer members. The groove is configured to accommodate the drive disk and the plurality of circumferential buffer members, and the circumferential buffer member is configured to elastically connect the drive disk to the groove in a circumferential direction of the drive disk. The disk generator reduces an overall volume on the premise of ensuring transmission efficiency.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 202410178195.2, filed on Feb. 8, 2024, which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The embodiments relate to the field of vehicle technologies, and to a disk generator integrated with a flywheel, a hybrid powertrain, and a vehicle.

BACKGROUND

[0003] In a range extended electric vehicle, an engine drives a generator to generate electricity, and the engine is in transmission with the generator through a flywheel disk. A structure in which the engine, the flywheel disk, and the generator are sequentially in transmission is complex and has a large volume. This affects transmission efficiency and power density of the generator, and is difficult to implement miniaturization.

SUMMARY

[0004] The embodiments provide a disk generator integrated with a flywheel, a hybrid powertrain, and a vehicle. A groove is disposed on the flywheel or a rotor to accommodate a torsional vibration damper, to implement integrated arrangement of the flywheel and the rotor, and reduce an overall volume on the premise of ensuring transmission efficiency. The embodiments include the following solutions.

[0005] According to a first aspect, the embodiments provide a disk generator integrated with a flywheel. The disk generator includes the flywheel, a stator, and a rotor, the flywheel, the rotor, and the stator are sequentially arranged adjacent to each other in an axial direction of the generator, the flywheel is configured to: be in transmission connection with an engine, and drive the rotor to rotate through a torsional vibration damper, and the torsional vibration damper includes a drive disk and a plurality of circumferential buffer members.

[0006] One of an end face that is of the rotor and that faces the flywheel or an end face that is of the flywheel and that faces the rotor includes a groove, and the other one of the end face that is of the rotor and that faces the flywheel or the end face that is of the flywheel and that faces the rotor is configured to fasten the drive disk of the torsional vibration damper.

[0007] The groove is configured to accommodate the drive disk and the plurality of circumferential buffer members, the circumferential buffer member is configured to elastically connect the drive disk to the groove in a circumferential direction of the drive disk, the groove is configured to fasten one end of the plurality of circumferential buffer members, and the drive disk is configured to fasten the other end of the plurality of circumferential buffer members.

[0008] In the disk generator integrated with the flywheel in the embodiments, the flywheel is elastically connected to the rotor in the circumferential direction of the generator through the torsional vibration damper, and the torsional vibration damper can filter vibration on an engine side, so that the flywheel can drive, under driving of the engine, the rotor to rotate to implement a power generation function. In the disk generator in the embodiments, the torsional vibration damper is embedded in the groove of the flywheel or the rotor, so that a distance between the flywheel and the rotor in the axial direction of the generator is reduced, and radial sizes of the flywheel and the rotor are controlled. The flywheel and the rotor form a compact integrated

arrangement structure, which reduces an overall volume on the premise of ensuring transmission efficiency.
[0009] In an implementation, in a circumferential direction of the generator, the plurality of circumferential buffer members is arranged at intervals between an outer peripheral wall of the drive disk and an inner peripheral wall of the groove, and in a radial direction of the generator, two ends of each circumferential buffer member are respectively fastened to the inner peripheral wall of the groove and the outer peripheral wall of the drive disk.
[0010] In this implementation, the drive disk is arranged in parallel with the plurality of circumferential buffer members in a direction perpendicular to the axial direction of the generator. The plurality of circumferential buffer members is accommodated between the outer peripheral wall of the drive disk and the inner peripheral wall of the groove in the radial direction of the generator, and the torsional vibration damper is compactly accommodated in the groove. This helps control an overall volume.
[0011] In an implementation, at least one of the inner peripheral wall of the groove or the outer peripheral wall of the drive disk includes a plurality of radial stoppers, and each radial stopper is configured to fasten one end of one circumferential buffer member; and the plurality of radial stoppers on the inner peripheral wall of the groove or the outer peripheral wall of the drive disk are arranged at intervals in the circumferential direction of the generator.
[0012] In this implementation, in the radial direction of the generator, the radial stoppers are located between the outer peripheral wall of the drive disk and the inner peripheral wall of the groove, so that the radial stopper can be fastened to an end part of the circumferential buffer member in the circumferential direction of the generator, and the radial stopper transfers torque to the rotor under driving of the circumferential buffer member.
[0013] In an implementation, in the radial direction of the generator, a distance between each radial stopper on the inner peripheral wall of the groove and an axis of the drive disk is less than a distance between each radial stopper on the outer peripheral wall of the drive disk and the axis of the drive disk.
[0014] In this implementation, the radial stopper on the inner peripheral wall of the groove at least partially overlaps the radial stopper on the outer peripheral wall of the drive disk in the radial direction of the generator, and force exerted to two opposite ends of the circumferential buffer member is balanced. This can improve transmission efficiency of the torsional vibration damper.
[0015] In an implementation, in an axial direction of the engine, the plurality of radial stoppers on the inner peripheral wall of the groove and the plurality of radial stoppers on the outer peripheral wall of the drive disk are arranged at intervals, and a sum of a thickness of the radial stopper on the inner peripheral wall of the groove and a thickness of the radial stopper on the outer peripheral wall of the drive disk is less than a depth of the groove.
[0016] In this implementation, a gap is reserved between the radial stopper on the inner peripheral wall of the groove and the radial stopper on the outer peripheral wall of the drive disk in the axial direction of the generator. This avoids interference between radial stoppers on both sides in a process in which the drive disk rotates relative to the groove, and increases a rotation angle of the drive disk in the groove, to achieve better vibration damping effect.
[0017] In an implementation, in the circumferential direction of the generator, widths of the radial stoppers are equal, and in the radial direction of the generator, each radial stopper on the inner peripheral wall of the groove is aligned with one radial stopper on the outer peripheral wall of the drive disk.
[0018] In this implementation, in the circumferential direction of the generator, side walls on two opposite sides of the radial stopper on the inner peripheral wall of the groove are respectively flush with side walls on two opposite sides of the radial stopper on the outer peripheral wall of the drive disk, so that more accommodation space may be reserved for the circumferential buffer member, a quantity of circumferential buffer members is reduced, and a circumferential length of each

circumferential buffer member is increased.
[0019] In an implementation, each circumferential buffer member includes a circumferential spring and two sliding blocks, the two sliding blocks are respectively fastened to two ends of the circumferential spring, the circumferential spring is configured to elastically connect the two sliding blocks, one of the two sliding blocks is configured to fasten the radial stopper on the inner peripheral wall of the groove, and the other sliding block is configured to fasten the radial stopper on the outer peripheral wall of the drive disk.
[0020] In this implementation, the two sliding blocks are elastically connected through the circumferential spring, and torque of rotation of the flywheel is buffered by the circumferential spring and then acts on the two sliding blocks, and is separately transferred to the radial stopper on the inner peripheral wall of the groove and the radial stopper on the outer peripheral wall of the drive disk, to implement a function of driving the rotor to rotate by the flywheel.
[0021] In an implementation, the circumferential spring is a compression spring, and the two sliding blocks slide in the circumferential direction of the generator and respectively abut the radial stopper on the inner peripheral wall of the groove and the radial stopper on the outer peripheral wall of the drive disk, to implement a torque transfer function.
[0022] In an implementation, the circumferential spring is a tension spring, the two sliding blocks slide in the circumferential direction of the generator and are respectively fastened to the radial stopper on the inner peripheral wall of the groove and the radial stopper on the outer peripheral wall of the drive disk, and the circumferential spring pulls the two sliding blocks to implement a torque transfer function.
[0023] In an implementation, at least one circumferential spring includes a plurality of segments of sub-springs, the plurality of segments of sub-springs are sequentially arranged in the circumferential direction of the generator, the circumferential buffer member includes a middle sliding block, and the middle sliding block is arranged between two adjacent segments of sub-springs in the circumferential direction of the generator.
[0024] In this implementation, the circumferential spring is divided into the plurality of segments of sub-springs in the circumferential direction of the generator, and the middle sliding block is embedded between adjacent sub-springs. This can improve overall stiffness of the circumferential spring, avoid a case in which the circumferential spring is overloaded and fails due to an excessively large compression amount, and ensure reliable torque transfer.
[0025] In an implementation, in the axial direction of the generator, a thickness of the sliding block is greater than a distance between the radial stopper on the outer peripheral wall of the drive disk and a bottom of the groove.
[0026] In this implementation, the radial stopper on the groove is close to the bottom of the groove in the axial direction of the generator. This facilitates processing of the radial stopper on the groove. The sliding block is attached to the bottom of the groove, and the thickness of the sliding block exceeds the distance between the radial stopper on the outer peripheral wall of the drive disk and the bottom of the groove, to ensure that the sliding block is at least partially attached to the radial stopper on the outer peripheral wall of the drive disk in the axial direction of the generator. This ensures that torque is reliably transferred between the radial stopper on the inner peripheral wall of the groove and the radial stopper on the outer peripheral wall of the drive disk.
[0027] In an implementation, in the axial direction of the generator, the thickness of the sliding block is less than or equal to the depth of the groove, and is greater than or equal to the sum of the thickness of the radial stopper on the inner peripheral wall of the groove and the thickness of the radial stopper on the outer peripheral wall of the drive disk.
[0028] In this implementation, the sliding block is attached to the bottom of the groove, and control on the thickness of the sliding block can ensure that the groove completely accommodates the sliding block, thereby reducing an axial gap between the flywheel and the rotor. The thickness of the sliding block is greater than or equal to the sum of the thickness of the radial stopper on the

inner peripheral wall of the groove and the thickness of the radial stopper on the outer peripheral wall of the drive disk, so that it can be ensured that the sliding block is completely attached to the radial stopper on the inner peripheral wall of the groove and the radial stopper on the outer peripheral wall of the drive disk, to effectively transfer torque.
[0029] In an implementation, in the axial direction of the generator, the thickness of the sliding block is less than or equal to the depth of the groove, and is greater than or equal to a sum of the thickness of the radial stopper on the inner peripheral wall of the groove, the thickness of the radial stopper on the outer peripheral wall of the drive disk, and a spacing between the radial stopper on the inner peripheral wall of the groove and the radial stopper on the outer peripheral wall of the drive disk.
[0030] In an implementation, the generator includes a housing, and the housing includes a sleeve and an end cover that are connected; [0031] the end cover is arranged on a side that is of the stator and that is away from the rotor in the axial direction of the generator, and the end cover is configured to fasten the stator; and [0032] the sleeve is sleeved on peripheries of the stator, the rotor, and the flywheel, an axial length of the sleeve is greater than a spacing between the flywheel and the end cover, and the sleeve is configured to shield an axial gap between the rotor and the flywheel.
[0033] In this implementation, the housing accommodates the stator, the rotor, and the flywheel, so that the generator and the flywheel are integrated. The sleeve of the housing shields the axial gap between the rotor and the flywheel, to protect the torsional vibration damper.
[0034] In an implementation, the generator includes a motor shaft; in the axial direction of the generator, one end of the motor shaft is configured to pass through the stator and is rotatably connected to the housing, and the other end includes a bearing accommodating hole; and the bearing accommodating hole is configured to accommodate a bearing; and [0035] the end face that is of the rotor and that faces the flywheel includes the groove, and the bearing is configured to be in coaxial transmission with the drive disk; or [0036] the end face that is of the flywheel and that faces the rotor includes the groove, and the bearing is configured to be in coaxial transmission with the flywheel.
[0037] In this implementation, the rotor is rotatably connected to the housing through the motor shaft, and the flywheel is rotatably connected to the rotor through the motor shaft. When the groove is located on the end face that is of the rotor and that faces the flywheel, the flywheel is fastened to the drive disk, and the flywheel is in coaxial transmission with the bearing of the motor shaft through the drive disk. When the groove is located on the end face that is of the flywheel and that faces the rotor, the rotor is fastened to the drive disk, and the flywheel is directly in coaxial transmission with the bearing of the motor shaft.
[0038] In an implementation, the end cover includes an axial connection column, and the axial connection column extends into an inner hole of the stator in the axial direction of the generator and is in coaxial transmission with the motor shaft.
[0039] In an implementation, the motor shaft extends into an inner hole of the axial connection column, and is rotatably connected to the axial connection column through the bearing.
[0040] In an implementation, the motor shaft is rotatably connected to the axial connection column through at least two bearings, and the at least two bearings are arranged at intervals in the axial direction of the generator.
[0041] In an implementation, the stator includes a stator core and a plurality of electromagnetic coils, the stator core is configured to fasten the end cover of the housing, the stator core includes a plurality of coil grooves, each coil groove is configured to accommodate and fasten one electromagnetic coil, and the plurality of coil grooves are arranged at intervals in a circumferential direction of the stator core.
[0042] In an implementation, the rotor includes a rotor backplane and a rotor magnet assembly, a magnet assembly accommodating groove is disposed on an end face that is of the rotor backplane

and that faces the stator, and the rotor magnet assembly is fastened in the magnet assembly accommodating groove.
[0043] In an implementation, the end face that is of the rotor and that faces the flywheel includes the groove, the bearing is configured to be in coaxial transmission with an axial connection portion of the drive disk, the generator includes a sealing ring, the sealing ring is fastened to the bottom of the groove, an inner diameter of the sealing ring is greater than or equal to an outer diameter of the axial connection portion, the sealing ring is configured to shield a radial gap between the axial connection portion and the rotor.
[0044] In this implementation, the groove is located on the end face that is of the rotor and that faces the flywheel, and the axial connection portion of the drive disk passes through the bottom of the groove and is in coaxial transmission with the bearing of the motor shaft. The groove is provided with a lubricant, and the sealing ring is configured to shield a radial gap between the groove and the axial connection portion of the drive disk to seal the groove, to prevent leakage of the lubricant and protect the torsional vibration damper.
[0045] In an implementation, the axial connection portion includes a radial boss, the radial boss is located on a side that is of the bearing and that is away from the stator in the axial direction of the generator, and an outer diameter of the radial boss is less than or equal to an outer diameter of an inner ring of the bearing.
[0046] In an implementation, the inner diameter of the sealing ring is greater than or equal to an inner diameter of an outer ring of the bearing.
[0047] In an implementation, the generator includes a groove cover, the groove cover is located between the flywheel and the rotor in the axial direction of the generator, an outer diameter of the groove cover is greater than a diameter of the inner peripheral wall of the groove, an inner diameter of the groove cover is less than a diameter of the outer peripheral wall of the drive disk, and the groove cover is fastened to a groove opening of the groove and is configured to shield a radial gap between the inner peripheral wall of the groove and the outer peripheral wall of the drive disk.
[0048] In this implementation, the groove cover is disposed on a groove opening side of the groove, to shield the radial gap between the outer peripheral wall of the drive disk and the inner peripheral wall of the groove, to seal the groove, prevent leakage of the lubricant, and protect the torsional vibration damper. The groove may be located in the rotor, and in this case, the groove cover is fastened to the rotor. The groove may alternatively be located in the flywheel, and in this case, the groove cover is fastened to the flywheel.
[0049] In an implementation, the generator includes an elastic baffle ring, and the elastic baffle ring is located between the groove cover and the drive disk in the axial direction of the generator. In the radial direction of the generator, an outer diameter of the elastic baffle ring is greater than the inner diameter of the groove cover, and an inner diameter of the elastic baffle ring is less than the diameter of the outer peripheral wall of the drive disk. The elastic baffle ring is configured to shield an axial gap between the groove cover and the drive disk, to further seal the groove to prevent leakage of the lubricant.
[0050] In an implementation, an end face that is of the drive disk and that faces the groove cover includes an annular stop, and the annular stop is configured to fasten the elastic baffle ring.
[0051] In an implementation, the elastic baffle ring is elastic in the axial direction of the generator; and two sides of the elastic baffle ring are respectively configured to abut the drive disk and the groove cover, to implement sealing.
[0052] According to a second aspect, the embodiments provide a hybrid powertrain. The hybrid powertrain includes the disk generator provided in any one of the foregoing implementations and at least one of an engine or a drive motor.
[0053] A crankshaft of the engine is connected to a flywheel of the disk generator, and the engine is configured to drive the flywheel to drive a rotor of the disk generator to rotate relative to a stator; or [0054] the drive motor is configured to rotate with a crankshaft of the engine, or is configured to

drive wheels of a vehicle by using electric energy generated by the disk generator.
[0055] According to a third aspect, the embodiments provide a vehicle. The vehicle includes wheels, a power battery, and the hybrid powertrain provided in the second aspect.
[0056] An engine of the hybrid powertrain is further configured to directly drive the wheels; and the power battery is configured to be charged by using electric energy generated by a disk generator.
[0057] Because the disk generator provided in the first aspect of the embodiments implements integration of the flywheel and the rotor, the disk generator has a small overall volume. In this way, internal space occupied by the disk generator in the vehicle is reduced. This facilitates miniaturization of the hybrid powertrain, arrangement of internal components of the vehicle, and control on a volume of the vehicle.

Description

BRIEF DESCRIPTION OF DRAWINGS
[0058] To describe solutions in the embodiments more clearly, the following briefly describes accompanying drawings for describing implementations. Clearly, the accompanying drawings in the following descriptions are merely some implementations of the embodiments, and a person of ordinary skill in the art may still derive other drawings from these accompanying drawings without creative efforts.
[0059] FIG. **1** is a diagram of an outline structure of a disk generator according to an embodiment;
[0060] FIG. **2** is a diagram of an exploded structure of a disk generator according to an embodiment;
[0061] FIG. **3** is a diagram of a cross-sectional structure of a disk generator according to an embodiment;
[0062] FIG. **4** is a diagram of a partial structure of a disk generator according to an embodiment;
[0063] FIG. **5** is a diagram of a partial exploded structure of a disk generator according to an embodiment;
[0064] FIG. **6** is a diagram of a partial cross-sectional structure of a disk generator according to an embodiment;
[0065] FIG. **7** is a diagram of a partial structure of a disk generator according to an embodiment;
[0066] FIG. **8** is a diagram of a partial exploded structure of a disk generator according to an embodiment;
[0067] FIG. **9** is a diagram of an outline structure of a rotor in a disk generator according to an embodiment;
[0068] FIG. **10** is a diagram of an outline structure of a drive disk in a disk generator according to an embodiment;
[0069] FIG. **11** is a diagram of a partial cross-sectional structure of a disk generator according to an embodiment;
[0070] FIG. **12** is a diagram of a partial cross-sectional structure of a disk generator according to an embodiment;
[0071] FIG. **13** is a diagram of an outline structure of a circumferential buffer member in a disk generator according to an embodiment;
[0072] FIG. **14** is a diagram of a cross-sectional structure of a disk generator according to an embodiment;
[0073] FIG. **15** is a diagram of an outline structure of a motor shaft in a disk generator according to an embodiment;
[0074] FIG. **16** is a diagram of a partial exploded structure of a disk generator according to an embodiment;

[0075] FIG. **17** is a diagram of a partial cross-sectional structure of a disk generator according to an embodiment;
[0076] FIG. **18** is a diagram of an outline structure of a housing in a disk generator according to an embodiment;
[0077] FIG. **19** is a diagram of an exploded structure of a motor shaft and bearings in a disk generator according to an embodiment;
[0078] FIG. **20** is a diagram of a cross-sectional structure of a motor shaft and bearings in a disk generator according to an embodiment;
[0079] FIG. **21** is a diagram of an outline structure of a stator in a disk generator according to an embodiment;
[0080] FIG. **22** is a diagram of a partial exploded structure of a disk generator according to an embodiment;
[0081] FIG. **23** is a diagram of an exploded structure of a rotor in a disk generator according to an embodiment;
[0082] FIG. **24** is a diagram of a partial exploded structure of a disk generator according to an embodiment;
[0083] FIG. **25** is a diagram of a partial cross-sectional structure of a disk generator according to an embodiment;
[0084] FIG. **26** is a diagram of a partial cross-sectional structure of a disk generator according to an embodiment;
[0085] FIG. **27** is a diagram of a partial cross-sectional structure of a disk generator according to an embodiment; and
[0086] FIG. **28** is a diagram of a partial cross-sectional structure of a disk generator according to an embodiment.

DETAILED DESCRIPTION OF EMBODIMENTS

[0087] The following describes solutions in embodiments with reference to accompanying drawings. It is clear that the described embodiments are merely some, but not all, of the embodiments. All other embodiments obtained by a person of ordinary skill in the art based on embodiments herein without creative efforts shall fall within their scope.

[0088] In the embodiments, terms such as “first” and “second” are sequence numbers of components, are merely intended to distinguish between the described objects, and do not have any sequential or technical meaning. Unless otherwise specified, a “connection” in the embodiments includes a direct connection and an indirect connection. In descriptions of the embodiments, it should be understood that orientation or position relationships indicated by the terms “above”, “below”, “front”, “back”, “top”, “bottom”, “inside”, “outside”, and the like are based on orientation or position relationships shown in the accompanying drawings, and are merely intended for ease of describing the embodiments and simplifying descriptions, rather than indicating or implying that a described apparatus or element needs to have a specific orientation or needs to be constructed and operated in a specific orientation. Therefore, such terms shall not be understood as a limitation on the embodiments.

[0089] In the embodiments, unless otherwise specified and limited, when a first feature is “above” or “below” a second feature, the first feature may be in direct contact with the second feature, or the first feature may be in indirect contact with the second feature through an intermediate medium. In addition, that the first feature is “above” or “on top of” the second feature may be that the first feature is right above or obliquely above the second feature, or merely mean that a horizontal height of the first feature is greater than that of the second feature. That the first feature is “below” or “under” the second feature may be that the first feature is right below or obliquely below the second feature, or merely mean that a horizontal height of the first feature is less than that of the second feature.

[0090] The embodiments provide a disk generator integrated with a flywheel. The disk generator includes the flywheel, a stator, and a rotor, the flywheel, the rotor, and the stator are sequentially arranged adjacent to each other in an axial direction of the generator, the flywheel is configured to: be in transmission connection with an engine, and drive the rotor to rotate through a torsional vibration damper, and the torsional vibration damper includes a drive disk and a plurality of circumferential buffer members.

[0091] One of an end face that is of the rotor and that faces the flywheel or an end face that is of the flywheel and that faces the rotor includes a groove, and the other one of the end face that is of the rotor and that faces the flywheel or the end face that is of the flywheel and that faces the rotor is configured to fasten the drive disk of the torsional vibration damper.

[0092] The groove is configured to accommodate the drive disk and the plurality of circumferential buffer members, the circumferential buffer member is configured to elastically connect the drive disk to the groove in a circumferential direction of the drive disk, the groove is configured to fasten one end of the plurality of circumferential buffer members, and the drive disk is configured to fasten the other end of the plurality of circumferential buffer members.

[0093] The disk generator integrated with the flywheel in the embodiments filters vibration on an engine side by using the torsional vibration damper, and the torsional vibration damper is embedded in the groove of the flywheel or the rotor, so that a distance between the flywheel and the rotor in the axial direction of the generator is reduced on the premise of ensuring transmission efficiency, and the flywheel and the rotor form a compact integrated arrangement structure.

[0094] The embodiments provide a hybrid powertrain. The hybrid powertrain includes the foregoing disk generator and at least one of an engine or a drive motor. A crankshaft of the engine is connected to a flywheel of the disk generator, and the engine is configured to drive the flywheel to drive a rotor of the disk generator to rotate relative to a stator; or the drive motor is configured to rotate with a crankshaft of the engine, or is configured to drive wheels of a vehicle by using electric energy generated by the disk generator. The foregoing disk generator is used in the hybrid powertrain in the embodiments, thereby facilitating miniaturization of the hybrid powertrain.

[0095] The embodiments provide a vehicle, including wheels, a power battery, and the hybrid powertrain provided in the second aspect. An engine of the hybrid powertrain is further configured to directly drive the wheels, and the power battery is configured to be charged by using electric energy generated by a disk generator. A volume of the hybrid powertrain in the vehicle in the embodiments is small, thereby facilitating arrangement of internal components of the vehicle and control on a volume of the vehicle.

[0096] In an embodiment, the vehicle further includes a power-consuming device, and the power battery is electrically connected to the power-consuming device. After the power battery is charged by using the electric energy generated by the disk generator, the power battery may supply power to the power-consuming device, to implement a corresponding function of the power-consuming device.

[0097] In an embodiment, the hybrid powertrain further includes a reducer. The reducer is in transmission connection between a drive motor and the wheels. The reducer is configured to: adjust output kinetic energy of the drive motor, and transmit processed kinetic energy to the wheels. The reducer increases a power output range of the hybrid powertrain, so that a rotational speed and torque of the wheels can match different use environments of the vehicle in the embodiments, thereby expanding an application scenario of the vehicle in the embodiments.

[0098] In an embodiment, the hybrid powertrain further includes a differential. The differential is in transmission connection between the reducer and the wheels. The differential can further adjust kinetic energy output by the reducer, and transmit adjusted kinetic energy to the wheels. The differential can enable kinetic energy transmitted by the hybrid powertrain to two wheels to be different, so that rotational speeds and torque of the two wheels can match different environments in a running process of the vehicle in the embodiments, thereby further expanding the application scenario of the vehicle in the embodiments.

[0099] Refer to a diagram that is of an outline structure of a disk generator **100** according to an embodiment and that is shown in FIG. **1**, a diagram that is of an exploded structure of the disk generator **100** according to an embodiment and that is shown in FIG. **2**, and a diagram that is of a cross-sectional structure of the disk generator **100** according to an embodiment and that is shown in FIG. **3**.

[0100] As shown in FIG. **1** to FIG. **3**, the disk generator **100** in the embodiments includes a flywheel **10**, a rotor **20**, a stator **30**, and a torsional vibration damper **40**, and an axis of the flywheel **10**, an axis of the rotor **20**, and an axis of the stator **30** all coincide with an axis of the disk generator **100** in the embodiments. The flywheel **10**, the rotor **20**, and the stator **30** are sequentially arranged in an axial direction of the disk generator **100** in the embodiments, and the flywheel **10**, the rotor **20**, and the stator **30** are spaced from each other in the axial direction of the disk generator **100**. The flywheel **10** is configured to rotatably connect to the rotor **20**, and the rotor **20** is configured to rotatably connect to the stator **30**. For example, the torsional vibration damper **40** is configured to rotatably connect the flywheel **10** to the rotor **20**.

[0101] In an embodiment, the disk generator **100** in the embodiments includes a housing **50**, the housing **50** is configured to accommodate and fasten the stator **30**, and the housing **50** is further configured to accommodate the rotor **20** and at least a part of the flywheel **10**. For example, the housing **50** includes an end cover **51** and a sleeve **52** that are connected to each other, the end cover **51** is arranged on a side that is of the stator **30** and that is away from the rotor **20** in the axial direction of the disk generator **100**, and the end cover **51** is configured to fasten the stator **30**. In a radial direction of the disk generator **100**, the sleeve **52** is sleeved on peripheries of the flywheel **10**, the rotor **20**, and the stator **30**.

[0102] In an embodiment, the disk generator **100** in the embodiments further includes a motor shaft **60**, the motor shaft **60** is configured to rotatably connect to the housing **50**, and the motor shaft **60** is further configured to fasten the rotor **20**. In other words, the motor shaft **60** is configured to rotatably connect the rotor **20** and the housing **50**, to implement rotatable connection between the rotor **20** and the stator **30**.

[0103] The torsional vibration damper **40** is accommodated in the flywheel **10** or the rotor **20**. An end face that is of the flywheel **10** and that is away from the rotor **20** is configured to be in transmission connection with a crankshaft of an engine. In an embodiment, the end face that is of the flywheel **10** and that is away from the rotor **20** is exposed relative to the housing **50**, and is fastened to the crankshaft of the engine. When the engine works, the crankshaft drives the flywheel **10** to rotate around the axis of the disk generator **100**, the rotating flywheel **10** inputs torque to the torsional vibration damper **40**, and the torsional vibration damper **40** processes the torque input by the flywheel **10**, transfers processed torque to the rotor **20**, and drives the rotor **20** to rotate relative to the stator **30**. In this way, a power generation function of the disk generator **100** in the embodiments is implemented.

[0104] The torsional vibration damper **40** is configured to rotatably connect the flywheel **10** to the rotor **20**. For details, refer to a diagram that is of a partial structure of a disk generator **100** according to an embodiment and that is shown in FIG. **4**, a diagram that is of a partial exploded structure of the disk generator **100** according to an embodiment and that is shown in FIG. **5**, and a diagram that is of a partial cross-sectional structure of the disk generator **100** according to an embodiment and that is shown in FIG. **6**. For ease of description, the housing **50** is omitted in FIG. **4** to FIG. **6**.

[0105] As shown in FIG. **4** to FIG. **6**, the rotor **20** has a first end face **21** facing the flywheel **10**, the first end face **21** includes a groove **22**, and the torsional vibration damper **40** is accommodated in the groove **22**. The torsional vibration damper **40** is fastened to the flywheel **10**, and is in transmission connection with the rotor **20**. A direction of transmission connection between the torsional vibration damper **40** and the rotor **20** is in a circumferential direction of the disk generator **100**. When the engine works, the flywheel **10** rotates relative to the housing **50** under driving of the crankshaft, and transfers torque to the rotor **20** through the torsional vibration damper **40**, to drive the rotor **20** to rotate relative to the stator **30**. In this way, the power generation function is implemented.

[0106] The first end face **21** of the rotor **20** and a second end face **11** of the flywheel **10** are disposed opposite to each other. It may be understood that disposing the groove **22** on the first end face **21** and embedding the torsional vibration damper **40** in the groove **22** reduce a spacing between the first end face **21** and the second end face **11** in the axial direction of the disk generator **100** on the premise of ensuring torque transfer effect between the flywheel **10** and the rotor **20**, so that a distance between the flywheel **10** and the rotor **20** in the axial direction of the disk generator **100** is reduced, and the flywheel **10** can cooperate with the rotor **20** to form a compact integrated arrangement structure. In this way, an overall volume of the disk generator **100** in the embodiments is further reduced, and a structure of the disk generator **100** in the embodiments is compact.

[0107] In an embodiment, as shown in FIG. **4** to FIG. **6**, the torsional vibration damper **40** includes a drive disk **41** and circumferential buffer members **42**, an end face that is of the drive disk **41** and that faces the flywheel **10** is configured to fasten the second end face **11** that is of the flywheel **10** and that faces the rotor **20**, and the circumferential buffer member **42** is configured to elastically connect an outer peripheral wall of the drive disk **41** to an inner peripheral wall of the groove **22** in the circumferential direction of the disk generator **100**.

[0108] For details, refer to a diagram that is of a partial structure of the disk generator **100** according to an embodiment and that is shown in FIG. **7** and a diagram that is of a partial exploded structure of the disk generator **100** according to an embodiment and that is shown in FIG. **8**.

[0109] As shown in FIG. **7** and FIG. **8**, an axis of the drive disk **41** coincides with the axis of the disk generator **100**. The plurality of circumferential buffer members **42** are disposed, and the plurality of circumferential buffer members **42** are arranged at intervals in the circumferential direction of the disk generator **100**. In the radial direction of the disk generator **100**, two ends of each circumferential buffer member **42** are respectively fastened to the inner peripheral wall of the groove **22** and the outer peripheral wall of the drive disk **41**. When the engine works, the flywheel **10** rotates relative to the housing **50** under driving of the crankshaft, and drives the drive disk **41** to rotate relative to the housing **50**. The rotating drive disk **41** causes circumferential deformation of the circumferential buffer member **42** in the circumferential direction of the disk generator **100**, and the circumferential buffer member **42** transfers, based on the circumferential deformation, torque to the other end of the circumferential buffer member **42** connected to the inner peripheral wall of the groove **22**. In this way, the torque is transferred to the rotor **20**, and a torque transfer function of the torsional vibration damper **40** is implemented.

[0110] Due to an operating characteristic of the engine, torque output by the engine during running may fluctuate, and when the fluctuating torque is transferred to the disk generator **100**, vibration and noise may be generated on a side that is of the disk generator **100** and that is close to the engine. Frequent changes of relative rotational speeds between the flywheel **10** and the rotor **20** affect torque transfer effect between the flywheel **10** and the rotor **20**. The flywheel **10** frequently collides with the rotor **20** in the circumferential direction of the disk generator **100**, reducing a service life of the disk generator **100**.

[0111] In this embodiment, when the fluctuating torque is transferred to the drive disk **41**, the circumferential buffer members **42** can slow down or absorb fluctuation of the torque transferred by the drive disk **41**. This reduces impact of fluctuation of the torque on rotation of the rotor **20**. This improves running stability of the disk generator **100** in the embodiments, reduces vibration and noise in a running process of the disk generator **100** in the embodiments, and implements a vibration damping function of the torsional vibration damper **40**.

[0112] In addition, the circumferential buffer members **42** are arranged in the groove **22** in the circumferential direction of the disk generator **100**, so that a space occupation ratio of the torsional vibration damper **40** in the radial direction of the disk generator **100** is reduced on the premise of ensuring the torque transfer function of the torsional vibration damper **40**, and radial sizes of the flywheel **10** and the rotor **20** are controlled. In addition, a space volume of the disk generator **100** in the embodiments is reduced in the axial direction, and the flywheel **10** and the rotor **20** form an integrated structure with compact arrangement, so that an overall volume of the disk generator **100** in the embodiments can be reduced, and the structure of the disk generator **100** in the embodiments is more compact.

[0113] In an embodiment, at least one of the inner peripheral wall of the groove **22** or the outer peripheral wall of the drive disk **41** includes a plurality of radial stoppers, and each radial stopper is configured to fasten one end of one circumferential buffer member **42**. For details, refer to a diagram that is of an outline structure of the rotor **20** in the disk generator **100** according to an embodiment and that is shown in FIG. **9** and a diagram that is of an outline structure of the drive disk **41** in the disk generator **100** according to an embodiment and that is shown in FIG. **10**. In addition, refer to FIG. **7** and FIG. **8** together.

[0114] As shown in FIG. **7** to FIG. **10**, a first radial stopper **221** is disposed on the inner peripheral wall of the groove **22**, the first radial stopper **221** extends toward the outer peripheral wall of the drive disk **41** in the radial direction of the disk generator **100**, a second radial stopper **411** is disposed on the outer peripheral wall of the drive disk **41**, and the second radial stopper **411** extends toward the inner peripheral wall of the groove **22** in the radial direction of the disk generator **100**. In other words, the radial stoppers extend into a gap between the outer peripheral wall of the drive disk **41** and the inner peripheral wall of the groove **22** in the radial direction of the disk generator **100**. Because the gap between the outer peripheral wall of the drive disk **41** and the inner peripheral wall of the groove **22** is used to accommodate the circumferential buffer members **42**, the radial stoppers can cooperate with the circumferential buffer members **42** in the circumferential direction of the disk generator **100**, to transfer the torque.

[0115] A plurality of first radial stoppers **221** and a plurality of second radial stoppers **411** are disposed, and the first radial stoppers **221** and the second radial stoppers **411** are arranged at intervals in the circumferential direction of the disk generator **100**. Each first radial stopper **221** and each second radial stopper **411** are configured to fasten one end of one circumferential buffer member **42**. In other words, two opposite ends that are of each circumferential buffer member **42** and that are in the circumferential direction of the disk generator **100** are configured to fixedly fit one first radial stopper **221** and one second radial stopper **411**. When the engine works, the flywheel **10** rotates relative to the housing **50** under driving of the crankshaft, and drives the drive disk **41** to rotate relative to the housing **50**. The drive disk **41** pushes, by using the second radial stopper **411**, the circumferential buffer member **42** to deform in the circumferential direction of the disk generator **100**, and the circumferential buffer member **42** pushes, based on circumferential deformation, the first radial stopper **221** to rotate around the axis of the disk generator **100**, to enable the rotor **20** to rotate relative to the stator **30**. In this way, the power generation function of the disk generator **100** in the embodiments is implemented.

[0116] In this embodiment, two first radial stoppers **221** are disposed, the two first radial stoppers **221** are evenly arranged in the circumferential direction of the disk generator **100**, two second radial stoppers **411** are disposed, and the two second radial stoppers **411** are evenly arranged in the circumferential direction of the disk generator **100**. It may be understood that, in some other embodiments, a quantity of first radial stoppers **221**, an arrangement manner of the first radial stoppers **221**, a quantity of second radial stoppers **411**, and an arrangement manner of the second radial stoppers **411** may alternatively be set in a matching manner based on different use requirements of the disk generator **100** in the embodiments. This is not limited.

[0117] In an embodiment, as shown in FIG. **7** to FIG. **10**, in the radial direction of the disk generator **100**, a distance between each first radial stopper **221** and the axis of the rotor **20** is less than a distance between each second radial stopper **411** and the axis of the drive disk **41**. Both the axis of the rotor **20** and the axis of the drive disk **41** coincide with the axis of the disk generator **100**

in the embodiments. It may be understood that, in the radial direction of the disk generator **100**, the first radial stopper **221** at least partially overlaps the second radial stopper **411**.
[0118] When the first radial stopper **221** is spaced from the second radial stopper **411** in the radial direction of the disk generator **100**, force exerted by the second radial stopper **411** on the circumferential buffer member **42** can deform the circumferential buffer member **42** in the circumferential direction of the disk generator **100**, and further deviate the circumferential buffer member **42** in the radial direction of the disk generator **100**. In other words, limitations imposed by the disk generator **100** in the embodiments on positions of the first radial stopper **221** and the second radial stopper **411** in the radial direction of the disk generator **100** reduce a possibility of a radial deviation of the circumferential buffer member **42** in a working process of the engine, so that force exerted on two opposite ends of each circumferential buffer member **42** is balanced, a torque loss in a process of transferring torque from the second radial stopper **411** to the first radial stopper **221** is reduced, and transmission efficiency of the torsional vibration damper **40** is improved.
[0119] Refer to a diagram that is of a partial cross-sectional structure of the disk generator **100** according to an embodiment and that is shown in FIG. **11** and a diagram that is of a partial cross-sectional structure of the disk generator **100** according to an embodiment and that is shown in FIG. **12**. In addition, refer to FIG. **7** to FIG. **10** together. FIG. **12** is a diagram of a partial cross-sectional structure of FIG. **11**.
[0120] As shown in FIG. **7** to FIG. **12**, in the axial direction of the disk generator **100**, a sum of a thickness of the first radial stopper **221** and a thickness of the second radial stopper **411** is less than a depth of the groove **22**, and the first radial stoppers **221** are spaced from the second radial stoppers **411**, to prevent the first radial stoppers **221** and the second radial stoppers **411** from interfering with each other in a rotating process of the drive disk **41** relative to the groove **22**, and ensure stable running of the disk generator **100** in the embodiments.
[0121] In this embodiment, a gap reserved between the first radial stoppers **221** and the second radial stoppers **411** in the axial direction of the disk generator **100** can further reduce a limitation on rotation of the drive disk **41** in the groove **22**. Therefore, a rotation angle of the drive disk **41** in the groove **22** is increased, utilization of the circumferential buffer members **42** is improved, and vibration damping effect of the torsional vibration damper **40** is improved.
[0122] In an embodiment, as shown in FIG. **7** to FIG. **12**, in the circumferential direction of the disk generator **100**, widths of the first radial stoppers **221** and widths of the second radial stoppers **411** are equal, and each first radial stopper **221** is aligned with one second radial stopper **411** in the radial direction of the disk generator **100**. It may be understood that, in the circumferential direction of the disk generator **100** in the embodiments, side walls that are of the first radial stopper **221** and the second radial stopper **411** and that are opposite to each other are flush with each other, so that a proportion of accommodation space of the first radial stopper **221** and the second radial stopper **411** in the groove **22** in the circumferential direction of the disk generator **100** is reduced. In this way, a proportion of accommodation space of the circumferential buffer members **42** in the circumferential direction of the disk generator **100** is increased, the circumferential buffer members **42** have large circumferential lengths, and the vibration damping function of the torsional vibration damper **40** is improved.
[0123] Each first radial stopper **221** is aligned with one second radial stopper **411** in the radial direction of the disk generator **100**, so that a quantity of circumferential buffer members **42** is reduced on the premise of ensuring the vibration damping function and the torque transfer function of the torsional vibration damper **40**, thereby reducing costs of the disk generator **100** in the embodiments.
[0124] Refer to a diagram that is of an outline structure of the circumferential buffer member **42** in the disk generator according to an embodiment and that is shown in FIG. **13**, and refer to FIG. **7** and FIG. **8** together.
[0125] As shown in FIG. **7**, FIG. **8**, and FIG. **13**, each circumferential buffer member **42** includes a

circumferential spring **421** and two sliding blocks **422**. An extension line of the circumferential spring **421** is arc-shaped, and an extension direction of the circumferential spring **421** is the circumferential direction of the disk generator **100**. In the circumferential direction of the disk generator **100**, two opposite ends of the circumferential spring **421** are respectively fastened to the two sliding blocks **422**, and the circumferential spring **421** is configured to elastically connect the two sliding blocks **422**.

[0126] In the circumferential direction of the disk generator **100**, the two sliding blocks **422** are arranged at intervals and are slidably connected to the groove **22**. The two sliding blocks **422** are respectively a first sliding block **4221** and a second sliding block **4222**, the first sliding block **4221** is configured to fasten the first radial stopper **221**, and the second sliding block **4222** is configured to fasten the second radial stopper **411**.

[0127] When the engine works, the flywheel **10** enables the drive disk **41** to rotate relative to the housing **50** under driving of the crankshaft. The rotating drive disk **41** sequentially transfers torque to the rotor **20** through the second sliding block **4222**, the circumferential spring **421**, and the first sliding block **4221**, so that the rotor **20** rotates relative to the stator **30**. In this way, the power generation function of the disk generator **100** in the embodiments is implemented.

[0128] As shown in FIG. **7**, each first radial stopper **221** is aligned with one second radial stopper **411**. It may be understood that, in the circumferential direction of the disk generator **100**, each circumferential buffer member **42** is located between two adjacent first radial stoppers **221**, and is also located between two adjacent second radial stoppers **411**.

[0129] For example, in an embodiment, the circumferential spring **421** is a compression spring, and the first sliding block **4221** and the second sliding block **4222** respectively abut the first radial stopper **221** and the second radial stopper **411** in the circumferential direction of the disk generator **100**. In the circumferential direction of the disk generator **100**, the first sliding block **4221** is configured to abut a side wall of the first radial stopper **221**, and the second sliding block **4222** is configured to abut a side wall of the second radial stopper **411**. The rotating drive disk **41** enables each second radial stopper **411** to rotate around the axis of the disk generator **100**, and each second radial stopper **411** may push one second sliding block **4222** to slide toward one first sliding block **4221** in the circumferential direction of the disk generator **100**.

[0130] A second radial stopper **411** pushes a corresponding second sliding block **4222** to compress a circumferential spring **421** connected to the second sliding block **4222**, after the circumferential spring **421** is compressed, the circumferential spring **421** forms pushing force toward a first sliding block **4221** connected to the other side of the circumferential spring **421**, and the first sliding block **4221** pushes the first radial stopper **221**, so that the first radial stopper **221** rotates around the axis of the disk generator **100**, to implement the torque transfer effect.

[0131] In a process in which the first sliding block **4221** pushes the first radial stopper **221**, the first sliding block **4221** always abuts the first radial stopper **221** in the circumferential direction of the disk generator **100**. Therefore, a position between the first sliding block **4221** and the first radial stopper **221** is fixed, that is, the inner peripheral wall (the first radial stopper **221**) of the groove **22** is configured to fasten one end (the first sliding block **4221**) of the circumferential buffer member **42**. Correspondingly, in a process in which the second radial stopper **411** pushes the second sliding block **4222**, the second sliding block **4222** always abuts the second radial stopper **411** in the circumferential direction of the disk generator **100**. Therefore, a position between the second sliding block **4222** and the second radial stopper **411** is fixed, that is, the outer peripheral wall (the second radial stopper **411**) of the drive disk **41** is configured to fasten to the other end (the second sliding block **4222**) of the circumferential buffer member **42**.

[0132] In another embodiment, the circumferential spring **421** is a tension spring, and the first sliding block **4221** and the second sliding block **4222** are respectively fastened to the first radial stopper **221** and the second radial stopper **411** in the circumferential direction of the disk generator **100**. The rotating drive disk **41** enables each second radial stopper **411** to rotate around the axis of the disk generator **100**, and each second radial stopper **411** may pull one sliding block **422** to slide in the circumferential direction of the disk generator **100**.

[0133] Each second radial stopper **411** may pull a corresponding second sliding block **4222** to stretch a circumferential spring **421** connected to the second sliding block **4222**, after the circumferential spring **421** is stretched, the circumferential spring **421** pulls a first sliding block **4221** connected to the other side of the circumferential spring **421**, and the first sliding block **4221** pulls a first radial stopper **221**, so that the first radial stopper **221** rotates around the axis of the disk generator **100**, to implement the torque transfer effect.

[0134] In a process in which the first sliding block **4221** pulls the first radial stopper **221**, the first sliding block **4221** is always attached to the first radial stopper **221** in the circumferential direction of the disk generator **100**. Therefore, the first sliding block **4221** is fastened to the first radial stopper **221**, that is, the inner peripheral wall (the first radial stopper **221**) of the groove **22** is configured to fasten one end (the first sliding block **4221**) of the circumferential buffer member **42**. Correspondingly, in a process in which the second radial stopper **411** pulls the second sliding block **4222**, the second sliding block **4222** is always attached to the second radial stopper **411** in the circumferential direction of the disk generator **100**. Therefore, the second sliding block **4222** is fastened to the second radial stopper **411**, that is, the outer peripheral wall (the second radial stopper **411**) of the drive disk **41** is configured to fasten the other end (the second sliding block **4222**) of the circumferential buffer member **42**.

[0135] In an embodiment, the sliding block **422** is a damping sliding block, so that when fluctuating torque is transferred to the sliding block **422**, damping in the sliding block **422** can absorb fluctuation in the torque. This further reduces vibration and noise in a running process of the disk generator **100** in the embodiments, and implements the vibration damping function of the torsional vibration damper **40**. In another embodiment, the bottom of the groove **22** may be further disposed in a matching manner as a friction surface with a specific roughness based on an actual use requirement of the torsional vibration damper **40**. In this way, friction force between the sliding block **422** and the bottom of the groove **22** is used to eliminate fluctuation in torque transferred to the sliding block **422** through the crankshaft.

[0136] In an embodiment, as shown in FIG. **7**, FIG. **8**, and FIG. **13**, at least one circumferential spring **421** includes a plurality of segments of sub-springs **4211**, and the plurality of segments of sub-springs **4211** are sequentially arranged in the circumferential direction of the disk generator **100**. The circumferential buffer member **42** further includes a middle sliding block **423**, and the middle sliding block **423** is embedded between two adjacent segments of sub-springs **4211** in the circumferential direction of the disk generator **100**.

[0137] For the circumferential spring **421**, when the circumferential spring **421** is compressed or stretched by external force, and the external force causes the circumferential spring **421** to deform in a direction of the extension line of the circumferential spring **421**, the circumferential spring **421** is deformed in a radial direction of curvature of the extension line of the circumferential spring **421**. When the extension line of the circumferential spring **421** is excessively long, and external force exerted on one side of the circumferential spring **421** is transferred to the other side in the direction of the extension line of the circumferential spring **421**, the external force transferred to the other side decreases as a length of the extension line of the circumferential spring **421** increases.

[0138] Therefore, the circumferential spring **421** is divided into the plurality of segments of sub-springs **4211** in the circumferential direction of the disk generator **100**, and the middle sliding block **423** is embedded between adjacent sub-springs **4211**, so that force transmission effect is not affected because the circumferential spring **421** is excessively long on the premise of ensuring circumferential force transmission effect of the circumferential spring **421**. In this embodiment, the circumferential spring **421** needs to be disposed as a compression spring or a tension spring. It may be understood that disposing of the plurality of segments of sub-springs **4211** can avoid a case in which the circumferential spring **421** is overloaded and fails due to an excessively large

compression amount or an excessively large stretching amount, and ensure reliability of torque transferred by the second sliding block **4222** to the first sliding block **4221** through the circumferential spring **421**.
[0139] In addition, disposing of the middle sliding block **423** can improve overall stiffness of the circumferential spring **421** on the premise of ensuring torque transfer of the circumferential spring **421**, avoid a case in which the circumferential spring **421** is overloaded and fails due to an increase in a compression amount or a stretching amount in a working process, and further ensure reliability of torque transfer of the torsional vibration damper **40**.
[0140] In this embodiment, the middle sliding block **423** is embedded between two adjacent segments of sub-springs **4211**. Each middle sliding block **423** is slidably connected to the groove **22**, and each middle sliding block **423** may slide in the circumferential direction of the disk generator **100**. It may be understood that sliding connection between the middle sliding block **423** and the groove **22** limits displacement of the middle sliding block **423** in the radial direction of the disk generator **100**. In this way, displacement of each segment of sub-spring **4211** connected to the middle sliding block **423** in the radial direction of the disk generator **100** is limited, a possibility of friction interference caused by contact between each segment of sub-spring **4211** and the inner peripheral wall of the groove **22** is reduced, and reliability of torque transfer of the torsional vibration damper **40** is further ensured.
[0141] In an embodiment, each circumferential spring **421** includes a plurality of segments of sub-springs **4211**, to further ensure reliability of torque transfer of the torsional vibration damper **40**. In this embodiment, two circumferential buffer members **42** are disposed, and lengths of the circumferential buffer members **42** in the circumferential direction of the disk generator **100** are equal. A circumferential spring **421** of each circumferential buffer member **42** includes three segments of sub-springs **4211**, and correspondingly, there are two middle sliding blocks **423**. It may be understood that, in some other embodiments, a quantity of circumferential buffer members **42**, a length of the circumferential buffer member **42** in the circumferential direction of the disk generator **100**, a quantity of sub-springs **4211** in each circumferential buffer member **42**, a length of each sub-spring **4211** in the circumferential direction of the disk generator **100**, and a quantity of corresponding middle sliding blocks **423** may alternatively be set in a matching manner based on different use requirements of the disk generator **100** in the embodiments. This is not limited.
[0142] In an embodiment, as shown in FIG. **7** to FIG. **11**, in the axial direction of the disk generator **100**, the second radial stopper **411** is closer to the bottom of the groove **22** than the first radial stopper **221**. This facilitates processing of the first radial stopper **221**. In the axial direction of the disk generator **100**, the sliding block **422** is attached to the bottom of the groove **22**, and a thickness of the sliding block **422** is greater than a distance between the second radial stopper **411** and the bottom of the groove **22**. In this way, each sliding block **422** is at least partially attached to the second radial stopper **411** in the axial direction of the disk generator **100**.
[0143] Each first radial stopper **221** is aligned with one second radial stopper **411**, and two opposite ends of each circumferential buffer member **42** are respectively fastened to the first radial stopper **221** and the second radial stopper **411**. It may be understood that, in the circumferential direction of the disk generator **100**, each sliding block **422** is attached to one first radial stopper **221** and one second radial stopper **411**, to reduce deviation of the extension line of the circumferential spring **421** in the axial direction of the disk generator **100**, and prevent torque transfer from being affected by an excessively large deviation of the circumferential spring **421** in the axial direction of the disk generator **100**. Therefore, reliability of torque transfer of the torsional vibration damper **40** is ensured.
[0144] In an embodiment, in the axial direction of the disk generator **100**, a thickness of each sliding block **422** is less than or equal to the depth of the groove **22**, and is greater than or equal to a sum of a thickness of the first radial stopper **221**, a thickness of the second radial stopper **411**, and a spacing between the first radial stopper **221** and the second radial stopper **411**.

[0145] Each sliding block **422** is attached to the bottom of the groove **22**. It may be understood that, disposing of the sliding block **422** with a thickness less than or equal to the depth of the groove **22** can ensure that the groove **22** completely accommodates the sliding block **422**, to reduce a spacing between the second end face **11** of the flywheel **10** and the first end face **21** of the rotor **20** in the axial direction of the disk generator **100**. The thickness of each sliding block **422** is set to be greater than or equal to the sum of the thickness of the first radial stopper **221**, the thickness of the second radial stopper **411**, and the spacing between the first radial stopper **221** and the second radial stopper **411**, so that it can be ensured that each sliding block **422** is completely attached to the first radial stopper **221** and the second radial stopper **411**, to further reduce deviation of the extension line of the circumferential spring **421** in the axial direction of the disk generator **100**, and further avoid impact on torque transfer caused by an excessively large deviation of the circumferential spring **421** in the axial direction of the disk generator **100**. Therefore, reliability of torque transfer of the torsional vibration damper **40** is further ensured.

[0146] In another embodiment, the second end face **11** that is of the flywheel **10** and that faces the rotor **20** includes a groove (shown as a groove **12** in FIG. **14**), and a structure of the groove **12** is similar to that of the groove **22**. The groove **12** is configured to accommodate the torsional vibration damper **40**. For details, refer to a diagram that is of a cross-sectional structure of the disk generator **100** according to an embodiment and that is shown in FIG. **14**. In this embodiment, an end face that is of the drive disk **41** and that faces the rotor **20** is configured to fasten the first end face **21** of the rotor **20**, and the circumferential buffer member **42** is configured to elastically connect the outer peripheral wall of the drive disk **41** to the inner peripheral wall of the groove **12** in the circumferential direction of the disk generator **100**. When the engine works, the flywheel **10** rotates relative to the housing **50** under driving of the crankshaft, and transfers torque to the rotor **20** through the torsional vibration damper **40**, to drive the rotor **20** to rotate relative to the stator **30**. In this way, the power generation function is implemented.

[0147] Therefore, based on limitations in the foregoing embodiments, in the disk generator **100** in the embodiments, the flywheel **10** is elastically connected to the rotor **20** in the circumferential direction of the disk generator **100** through the torsional vibration damper **40**, so that torque of the flywheel **10** driven by the engine through the crankshaft can be transferred to the torsional vibration damper **40**, and the torsional vibration damper **40** absorbs fluctuation in the torque and then transfers the torque to the rotor **20**, and enables the rotor **20** to rotate relative to the stator **30**. In this way, the power generation function of the disk generator **100** in the embodiments is implemented.

[0148] In the disk generator **100** in the embodiments, the torsional vibration damper **40** is further embedded in the groove **12** of the flywheel **10** or the groove **22** of the rotor **20**, thereby reducing a spacing between the first end face **21** and the second end face **11** in the axial direction of the disk generator **100**, and reducing a spacing between the flywheel **10** and the rotor **20** in the axial direction of the disk generator **100**. In addition, the circumferential buffer members **42** of the torsional vibration damper **40** are arranged in the circumferential direction of the disk generator **100**, to control sizes of the flywheel **10** and the rotor **20** in the radial direction of the disk generator **100**. In this way, the flywheel **10** and the rotor **20** can cooperate to form a compact integrated arrangement structure, so that an overall volume of the disk generator **100** in the embodiments is reduced on the premise of ensuring transmission efficiency of the disk generator **100** in the embodiments, and a structure of the disk generator **100** in the embodiments is compact.

[0149] In the disk generator **100** in the embodiments, the flywheel **10** and the rotor **20** are integrated, so that the disk generator **100** in the embodiments has a compact structure and a small overall volume. When the disk generator **100** in the embodiments is used in a hybrid powertrain, the disk generator **100** in the embodiments can convert kinetic energy of an engine into electric energy, and reduce a volume of the disk generator **100**, thereby miniaturizing the hybrid powertrain.

[0150] It may be understood that internal space occupied by the hybrid powertrain in the embodiments in a vehicle is reduced, so that arrangement of internal components of the vehicle and control on an overall volume of the vehicle are facilitated. Therefore, the vehicle in the embodiments has characteristics of a compact structure and a small overall volume.
[0151] In addition, for the disk generator **100** in the embodiments, the flywheel **10** is equivalent to primary mass, the rotor **20** and the motor shaft **60** are equivalent to secondary mass, and the primary mass and the secondary mass cooperate with the torsional vibration damper **40**, to form a dual mass flywheel-torsion vibration damping system of the disk generator **100** in the embodiments. When the dual mass flywheel-torsion vibration damping system is applied to the vehicle in the embodiments, a bending load of the crankshaft of the engine connected to the disk generator **100** in the embodiments can be further reduced, and a service life of a crankshaft bearing and a service life of the engine can be prolonged.
[0152] It may be understood that, in another embodiment, the disk generator in the embodiments may be further used in another use scenario, for example, used in a rail vehicle or an aircraft. This is not limited.
[0153] In an embodiment, refer back to FIG. **1** to FIG. **3**. The end cover **51** of the housing **50** is arranged on a side that is of the stator **30** and that is away from the rotor **20** in the axial direction of the disk generator **100**, the end cover **51** is configured to fasten to the stator **30**, and the sleeve **52** of the housing **50** is sleeved on peripheries of the stator **30**, the rotor **20**, and the flywheel **10**. The sleeve **52** is configured to cooperate with the end cover **51** to form an accommodating cavity (not shown in the figure) to accommodate the stator **30**, the rotor **20**, and the flywheel **10**, so that the flywheel **10** is integrated into the disk generator **100** in the embodiments, and a structure of the disk generator **100** in the embodiments is more compact.
[0154] An axial length of the sleeve **52** of the housing **50** is greater than a spacing between the flywheel **10** and the end cover **51** of the housing **50**. The sleeve **52** extends from the end cover **51** toward the flywheel **10**, and an extension length of the sleeve **52** exceeds the first end face **21** of the rotor **20** and the second end face **11** of the flywheel **10**. Therefore, the sleeve **52** may be configured to shield an axial gap between the rotor **20** and the flywheel **10**, to prevent external impurities from entering the torsional vibration damper **40** through the axial gap between the rotor **20** and the flywheel **10**, and avoid impact of the external impurities on torque transfer effect and vibration damping effect of the torsional vibration damper **40**.
[0155] In an embodiment, as shown in FIG. **1** to FIG. **3**, the motor shaft **60** is configured to rotatably connect the rotor **20** and the housing **50**. In the axial direction of the disk generator **100** in the embodiments, one end of the motor shaft **60** is configured to pass through the stator **30** and is rotatably connected to the housing **50**, the other end includes a bearing accommodating hole, and the bearing accommodating hole is configured to accommodate a first bearing **71**. A middle section of the motor shaft **60** is configured to fasten the rotor **20**. For example, the motor shaft **60** includes a first section **61** and a second section **62** that are connected to each other, the first section **61** is configured to pass through the stator **30** and is rotatably connected to the housing **50**, and an outer circumferential surface of the second section **62** is configured to fasten the rotor **20**, to implement rotatable connection between the rotor **20** and the housing **50**.
[0156] The bearing accommodating hole **63** is disposed on an end face that is of the second section **62** and that is away from the first section **61**, the first bearing **71** is accommodated in the bearing accommodating hole **63**, and an inner circumferential surface of the bearing accommodating hole **63** is configured to fasten an outer circumferential surface of an outer ring of the first bearing **71**. The first bearing **71** is configured to be in coaxial transmission with the drive disk **41**. For example, refer to a diagram that is of an outline structure of the motor shaft **60** in the disk generator **100** according to an embodiment and that is shown in FIG. **15**, a diagram that is of a partial exploded structure of the disk generator **100** according to an embodiment and that is shown in FIG. **16**, and a diagram that is of a partial cross-sectional structure of the disk generator **100** according to an

embodiment and that is shown in FIG. **17**.

[0157] As shown in FIG. **15** to FIG. **17**, the outer circumferential surface of the outer ring of the first bearing **71** is attached to a hole wall (an inner circumferential surface) of the bearing accommodating hole **63**, and an end part that is of the drive disk **41** fastened to the flywheel **10** and that faces the rotor **20** extends into an inner ring of the first bearing **71** and is fastened to the inner ring of the first bearing **71**. An axis of the motor shaft **60** coincides with the axis of the disk generator **100**, and an axis of the bearing accommodating hole **63** also coincides with the axis of the disk generator **100**.

[0158] When the engine works, the flywheel **10** rotates around the axis of the disk generator **100** under driving of the crankshaft, and the drive disk **41** rotates under action of torque of the flywheel **10**, and drives the inner ring of the first bearing **71** to rotate, to enable the drive disk **41** to rotate relative to the housing **50** around the axis of the disk generator **100**. The flywheel **10** is in coaxial transmission with the first bearing **71** on the motor shaft **60** through the drive disk **41**. It may be understood that disposing of the first bearing **71** ensures coaxial transmission between the drive disk **41** and the rotor **20**.

[0159] In another embodiment, refer back to FIG. **14**. When the groove **12** is disposed on the second end face **11** that is of the flywheel **10** and that faces the rotor **20**, an end part that is of the flywheel **10** and that faces the rotor **20** further extends into the inner ring of the first bearing **71** and is fastened to the inner ring of the first bearing **71**, so that the flywheel **10** can be directly in coaxial transmission with the first bearing **71** of the motor shaft **60**. In this case, the drive disk **41** is fastened relative to the rotor **20**, and the first bearing **71** is configured to be in coaxial transmission with the flywheel **10**. It may be understood that disposing of the first bearing **71** ensures coaxial transmission between the flywheel **10** and the rotor **20**.

[0160] In an embodiment, as shown in FIG. **15** to FIG. **17**, a first radial protrusion **631** is disposed on the hole wall of the bearing accommodating hole **63**. In the axial direction of the disk generator **100**, the first bearing **71** is located on a side that is of the first radial protrusion **631** and that is close to an opening of the bearing accommodating hole **63**. In the radial direction of the disk generator **100**, a spacing between the first radial protrusion **631** and the axis of the disk generator **100** is less than or equal to a spacing between the outer ring of the first bearing **71** and the axis of the disk generator **100**. The first radial protrusion **631** is configured to limit displacement of the first bearing **71** in the axial direction of the disk generator **100**.

[0161] Refer to a diagram that is of an outline structure of the housing **50** in the disk generator **100** according to an embodiment and that is shown in FIG. **18**, and refer to FIG. **15** to FIG. **17** together.

[0162] As shown in FIG. **15** to FIG. **18**, the end cover **51** includes an axial connection column **511**, the axial connection column **511** is disposed on an end face that is of the end cover **51** and that faces the stator **30**, and the axial connection column **511** extends into an inner hole of the stator **30** in the axial direction of the disk generator **100** and is in coaxial transmission with the motor shaft **60**. For example, the axial connection column **511** is fastened to the first section **61** of the motor shaft **60** through a bearing. In the axial direction of the disk generator **100**, the axial connection column **511** is spaced from the rotor **20**. When the engine works, the flywheel **10** drives the drive disk **41** to rotate through the crankshaft, the rotating drive disk **41** transfers torque to the rotor **20** through the circumferential buffer member **42**, to enable the rotor **20** to rotate relative to the housing **50** (the axial connection column **511**), and the rotating rotor **20** drives the motor shaft **60** to rotate relative to the housing **50**. This implements coaxial transmission between the motor shaft **60** and the housing **50**.

[0163] In an embodiment, as shown in FIG. **15** to FIG. **18**, the motor shaft **60** extends into an inner hole of the axial connection column **511**, and is rotatably connected to the axial connection column **511** through a bearing. The axial connection column **511** is provided with a first through hole **5111** that penetrates the axial connection column **511** in the axial direction of the disk generator **100**, and an axis of the first through hole **5111** coincides with the axis of the disk generator **100**.

[0164] The disk generator **100** in the embodiments further includes a second bearing **72**, the second bearing **72** is accommodated in the first through hole **5111**, and an outer circumferential surface of an outer ring of the second bearing **72** is fastened to a hole wall (an inner circumferential surface) of the first through hole **5111**. The first section **61** of the motor shaft **60** extends into the first through hole **5111**, and extends into an inner ring of the second bearing **72** to fasten to the inner ring of the second bearing **72**. In this way, the motor shaft **60** is rotatably connected to the axial connection column **511** through the second bearing **72**.
[0165] It may be understood that disposing of the second bearing **72** implements coaxial disposing of the housing **50** and the motor shaft **60**, so that the flywheel **10**, the rotor **20**, and the stator **30** are coaxially arranged. In this way, a space volume of the disk generator **100** in the embodiments on in the axial direction is reduced, and an overall volume of the disk generator **100** in the embodiments is further reduced, so that a structure of the disk generator **100** in the embodiments is more compact.
[0166] In addition, disposing of the second bearing **72** limits radial shaking of components in the disk generator **100**, thereby reducing noise and vibration generated in a running process of the disk generator **100** in the embodiments, and improving running efficiency and running stability of the disk generator **100** in the embodiments.
[0167] In an embodiment, as shown in FIG. **15** to FIG. **18**, the motor shaft **60** is rotatably connected to the axial connection column **511** through at least two bearings, and the at least two bearings are arranged at intervals in the axial direction of the disk generator **100**. For example, the disk generator **100** in the embodiments further includes at least one second bearing **72** and at least one third bearing **73**, the third bearing **73** is accommodated in the first through hole **5111**, and the second bearing **72** is closer to the rotor **20** than the third bearing **73** in the axial direction of the disk generator **100**.
[0168] An outer ring of the third bearing **73** is fastened to a hole wall of the first through hole **5111**. The first section **61** of the motor shaft **60** extends into the first through hole **5111**, and sequentially passes through the second bearing **72** and the third bearing **73**. The first section **61** is separately fastened to an inner ring of the second bearing **72** and an inner ring of the third bearing **73**. In this way, the motor shaft **60** is rotatably connected to the axial connection column **511** through the second bearing **72** and the third bearing **73**.
[0169] It may be understood that disposing of the second bearing **72** and the third bearing **73** increases a contact area between the motor shaft **60** and the axial connection column **511** on the premise of ensuring rotatable connection between the motor shaft **60** and the axial connection column **511**, so that a load transmitted to the motor shaft **60** through the axial connection column **511** can be transmitted to the motor shaft **60** through the second bearing **72** and the third bearing **73**. Therefore, a load of a single bearing is reduced, and a service life of the second bearing **72** and a service life of the third bearing **73** are prolonged.
[0170] In addition, disposing the second bearing **72** and the third bearing **73** in a matching manner further ensures coaxial disposing of the housing **50** and the motor shaft **60**, and prevents the motor shaft **60** from forming a structure similar to a cantilever support. This further reduces noise and vibration generated in a running process of the disk generator **100** in the embodiments, and improves running efficiency and running stability of the disk generator **100** in the embodiments.
[0171] In this embodiment, there is one second bearing **72**, and there is also one third bearing **73**. It may be understood that, in some other embodiments, a quantity of second bearings **72**, a quantity of third bearings **73**, a type of the second bearings **72**, a type of the third bearings **73**, an arrangement manner of the second bearings **72**, and an arrangement manner of the third bearings **73** may be alternatively set in a matching manner based on different bearing requirements and transmission requirements of the disk generator **100**. This is not limited.
[0172] In an embodiment, as shown in FIG. **17** and FIG. **18**, a radial protrusion **5112** is disposed on an inner wall of the first through hole **5111** of the axial connection column **511**, and the radial

protrusion **5112** extends in the radial direction of the disk generator **100** and is spaced from the second section **62** of the motor shaft **60**. In the axial direction of the disk generator **100**, the second bearing **72** and the third bearing **73** are respectively arranged on two opposite sides of the radial protrusion **5112**, and an outer ring of the second bearing **72** and an outer ring of the third bearing **73** are respectively fastened on the two opposite sides of the radial protrusion **5112**, to limit a spacing between the second bearing **72** and the third bearing **73** in the axial direction of the disk generator **100**.

[0173] In an embodiment, the motor shaft **60** further includes a limiting ring **64**. For example, refer to a diagram that is of an exploded structure of the motor shaft **60** and bearings in the disk generator **100** according to an embodiment and that is shown in FIG. **19** and a diagram that is of a partial cross-sectional structure of the motor shaft **60** and bearings in the disk generator **100** according to an embodiment and that is shown in FIG. **20**.

[0174] The limiting ring **64** is sleeved on an outer edge of the second section **62**, and is fastened to the second section **62**. In the radial direction of the disk generator **100**, an outer wall of the limiting ring **64** is spaced from the inner wall of the first through hole **5111**. In the axial direction of the disk generator **100**, the second bearing **72** and the third bearing **73** are respectively arranged on two opposite sides of the limiting ring **64**, and the inner ring of the second bearing **72** and the inner ring of the third bearing **73** are respectively fastened to the two opposite ends of the limiting ring **64**, to limit the spacing between the second bearing **72** and the third bearing **73** in the axial direction of the disk generator **100**.

[0175] In the radial direction of the disk generator **100**, the radial protrusion **5112** and the limiting ring **64** are aligned with each other, and a spacing between the radial protrusion **5112** and the axis of the disk generator **100** is greater than or equal to an inner diameter of an outer ring of the second bearing **72** and an inner diameter of an outer ring of the third bearing **73**. An outer diameter of the limiting ring **64** is less than or equal to an outer diameter of the inner ring of the second bearing **72** and an outer diameter of the inner ring of the third bearing **73**. The second radial protrusion **5112** and the limiting ring **64** are configured to cooperate with each other to limit the spacing between the second bearing **72** and the third bearing **73** in the axial direction of the disk generator **100**.

[0176] A magnetic structure is disposed in the rotor **20**, and a magnetically conductive structure is disposed in the stator **30**. Therefore, a magnetic field in the rotor **20** can enable the rotor **20** and the stator **30** to generate mutual attraction electromagnetic force in the axial direction of the disk generator **100**. In addition, in the axial direction of the disk generator **100**, a magnetic gap is reserved between the rotor **20** and the stator **30**.

[0177] The magnetic gap between the rotor **20** and the stator **30** can enable the magnetic field generated by the rotor **20** to be partially concentrated at a junction between the magnetic field generated by the rotor **20** and the stator **30**, increase a quantity of magnetic induction lines that pass through the magnetic gap and enter the stator **30**, and improve electromagnetic induction effect in the stator **30**, thereby improving the power generation capability of the disk generator **100** in the embodiments. In addition, existence of the magnetic gap can further reduce impact of relative motion between the rotor **20** and the stator **30**, avoid contact friction between the rotor **20** and the stator **30** when the rotor **20** rotates relative to the stator **30**, and ensure a rotational speed of the rotor **20** relative to the stator **30**, thereby ensuring the power generation capability of the disk generator **100** in the embodiments.

[0178] The rotor **20** is fastened to the motor shaft **60**, and the stator **30** is fastened to the housing **50**. Therefore, when electromagnetic force generated between the stator **30** and the rotor **20** causes the stator **30** and the rotor **20** to flutter in the axial direction of the disk generator **100**, the electromagnetic force also drives the motor shaft **60** and the housing **50** to generate relative displacement in the axial direction of the disk generator **100**. As a result, the second bearing **72** and the third bearing **73** are close to each other in the axial direction of the disk generator **100**. It may be understood that disposing of the second radial protrusion **5112** and the limiting ring **64** limits the spacing between the second bearing **72** and the third bearing **73** in the axial direction of the disk generator **100**. Therefore, a spacing between the motor shaft **60** and the housing **50** in the axial direction of the disk generator **100** is limited. In this way, the magnetic gap between the rotor **20** and the stator **30** in the axial direction of the disk generator **100** is ensured.

[0179] In an embodiment, as shown in FIG. **17** to FIG. **20**, the motor shaft **60** further includes a first limiting shaft sleeve **65**, and the first limiting shaft sleeve **65** is accommodated in the bearing accommodating hole **63**. The first limiting shaft sleeve **65** is ring-shaped, and the first limiting shaft sleeve **65** is sleeved on an outer edge of the axial connection column **511** and is fastened to the axial connection column **511**. In the axial direction of the disk generator **100**, the first limiting shaft sleeve **65** is fastened on a side that is of the first bearing **71** and that faces the second bearing **72**. In the radial direction of the disk generator **100**, an outer diameter of the first limiting shaft sleeve **65** is less than or equal to an outer diameter of the inner ring of the first bearing **71**. The first limiting shaft sleeve **65** is configured to limit displacement of the first bearing **71** in the axial direction of the disk generator **100** on the premise of ensuring a transmission function of the first bearing **71**.

[0180] In an embodiment, as shown in FIG. **19** and FIG. **20**, a radial bump **621** is disposed on the second section **62** of the motor shaft **60**, and the radial bump **621** protrudes in the radial direction of the disk generator **100**. In the axial direction of the disk generator **100**, the radial bump **621** is located on a side that is of the second bearing **72** and that is away from the third bearing **73**. In the radial direction of the disk generator **100**, an outer diameter of the radial bump **621** is less than or equal to the outer diameter of the inner ring of the second bearing **72**. The radial bump **621** is configured to cooperate with the limiting ring **64**, to further limit displacement of the second bearing **72** in the axial direction of the disk generator **100** on the premise of ensuring the transmission function of the second bearing **72**.

[0181] In an embodiment, as shown in FIG. **19** and FIG. **20**, the motor shaft **60** further includes a second limiting shaft sleeve **66**, and the second limiting shaft sleeve **66** is sleeved on the outer edge of the second section **62** and is fastened to the second section **62**. In the axial direction of the disk generator **100**, the second limiting shaft sleeve **66** is fastened on a side that is of the third bearing **73** and that is away from the second bearing **72**. In the radial direction of the disk generator **100**, an outer diameter of the second limiting shaft sleeve **66** is less than or equal to the outer diameter of the inner ring of the third bearing **73**. The second limiting shaft sleeve **66** is configured to cooperate with the limiting ring **64**, to further limit displacement of the third bearing **73** in the axial direction of the disk generator **100** on the premise of ensuring the transmission function of the third bearing **73**.

[0182] Refer to a diagram that is of an outline structure of the stator **30** in the disk generator **100** according to an embodiment and that is shown in FIG. **21**. In addition, refer to FIG. **1** to FIG. **3** together.

[0183] As shown in FIG. **1**, FIG. **2**, FIG. **3**, and FIG. **21**, the stator **30** includes a stator core **31** and a plurality of electromagnetic coils **32**, the stator core **31** is configured to fasten the end cover **51** of the housing **50**, the stator core **31** includes a plurality of coil grooves **311**, each coil groove **311** is configured to accommodate and fasten one electromagnetic coil **32**, and the plurality of coil grooves **311** are arranged at intervals in a circumferential direction of the stator core **31**.

[0184] When the engine works, the flywheel **10** drives, through the crankshaft, the drive disk **41** to rotate relative to the housing **50**, and the drive disk **41** transfers torque to the rotor **20** through the circumferential buffer member **42**, so that the rotor **20** rotates relative to the stator **30**. A magnetic rotor magnet assembly (not shown in the figure) in the rotor **20** rotates with the rotor **20**. The stator core **31** centralizes magnetic induction lines of the rotor **20** and guides the magnetic induction lines to the electromagnetic coils **32**. The rotating rotor **20** enables the electromagnetic coils **32** to move in a direction of cutting the magnetic induction lines, to generate induced electromotive force in the electromagnetic coils **32**, thereby implementing the power generation function of the disk generator **100** in the embodiments.

[0185] It may be understood that the plurality of electromagnetic coils **32** are disposed in a matching manner with the plurality of coil grooves **311**.
[0186] Refer to a diagram that is of a partial exploded structure of the disk generator **100** according to an embodiment and that is shown in FIG. **22** and a diagram that is of an exploded structure of the rotor **20** in the disk generator **100** according to an embodiment and that is shown in FIG. **23**. In addition, refer to FIG. **2** and FIG. **3** together.
[0187] As shown in FIG. **2**, FIG. **3**, FIG. **22**, and FIG. **23**, the rotor **20** includes a rotor backplane **23** and a rotor magnet assembly **24**, a magnet assembly accommodating groove **25** is disposed on an end face that is of the rotor backplane **23** and that faces the stator **30** in the axial direction of the disk generator **100**, and the rotor magnet assembly **24** is fastened in the magnet assembly accommodating groove **25**. In the axial direction of the disk generator **100**, the groove **22** is disposed on the first end face **21** that is of the rotor backplane **23** and that faces the flywheel **10**.
[0188] The rotor backplane **23** is further provided with a second through hole **26** that penetrates the rotor backplane **23** in the axial direction of the disk generator **100**, and the second through hole **26** connects the groove **22** and the magnet assembly accommodating groove **25**. The first section **61** of the motor shaft **60** extends into the second through hole **26**, and the first section **61** is fastened to the rotor backplane **23** in a key connection manner.
[0189] In an embodiment, the rotor backplane **23** is produced by using a non-magnetic material, to prevent magnetic induction lines generated by the rotor magnet assembly **24** from escaping outward through the rotor backplane **23**, and avoid impact of the rotor backplane **23** on a magnetic circuit.
[0190] In an embodiment, as shown in FIG. **1** to FIG. **3**, an end face (the first end face **21**) that is of the rotor **20** and that faces the flywheel **10** includes the groove **22**. An axial connection portion **412** is disposed on an end face that is of the drive disk **41** and that is away from the flywheel **10**. The axial connection portion **412** extends into the inner ring of the first bearing **71** in the axial direction of the disk generator **100**, and is fastened to the inner ring of the first bearing **71**. The first bearing **71** is configured to implement coaxial transmission between the drive disk **41** and the rotor **20**.
[0191] Refer to a diagram that is of a partial exploded structure of the disk generator **100** according to an embodiment and that is shown in FIG. **24** and a diagram that is of a partial cross-sectional structure of the disk generator **100** according to an embodiment and that is shown in FIG. **25**. In addition, refer to FIG. **2** and FIG. **3** together.
[0192] As shown in FIG. **2**, FIG. **3**, FIG. **24**, and FIG. **25**, the disk generator **100** in the embodiments further includes a sealing ring **81**, and the sealing ring **81** is fastened to the bottom of the groove **22**. For example, refer to a diagram that is of a partial cross-sectional structure of the disk generator **100** according to an embodiment and that is shown in FIG. **26**. FIG. **26** is a diagram of the partial cross-sectional structure of FIG. **25**.
[0193] An inner diameter of the sealing ring **81** is greater than or equal to an outer diameter of the axial connection portion **412**, and the sealing ring **81** is configured to shield a gap between the axial connection portion **412** and the rotor **20** in the radial direction of the disk generator **100**.
[0194] In an embodiment, a lubricant may be coated inside the groove **22** (or the groove **12**), and the lubricant is used to lubricate the circumferential buffer member **42**, the drive disk **41**, and the like, to reduce friction force generated when the torsional vibration damper **40** moves in the groove **22**, and improve transmission efficiency. In this embodiment, the sealing ring **81** is configured to prevent the lubricant disposed in the groove **22** from overflowing outward through the gap. This ensures content of the lubricant acting on the circumferential buffer member **42** of the torsional vibration damper **40**, protects the torsional vibration damper **40**, and further prevents the lubricant from affecting cooperative power generation between the rotor **20** and the stator **30**.
[0195] In an embodiment, as shown in FIG. **2**, FIG. **3**, FIG. **24**, FIG. **25**, and FIG. **26**, the axial connection portion **412** includes a radial boss **4121**, the radial boss **4121** is located on a side that is of the first bearing **71** and that is away from the stator **30** in the axial direction of the disk generator

100. In the radial direction of the disk generator **100**, an outer diameter of the radial boss **4121** is less than or equal to the outer diameter of the inner ring of the first bearing **71**. The radial boss **4121** is configured to shield a gap between the inner ring of the first bearing **71** and the axial connection portion **412** in the radial direction of the disk generator **100**, to further block leakage of the lubricant, ensure content of the lubricant acting on the circumferential buffer member **42** of the torsional vibration damper **40**, protect the torsional vibration damper **40**, and improve transmission efficiency.

[0196] In an embodiment, an inner diameter of the sealing ring **81** is greater than or equal to an inner diameter of the outer ring of the first bearing **71**. The sealing ring **81** is configured to shield a gap between the outer ring of the first bearing **71** and the rotor **20** in the radial direction of the disk generator **100**, to further block leakage of the lubricant, ensure content of the lubricant acting on the circumferential buffer member **42** of the torsional vibration damper **40**, and protect the torsional vibration damper **40**.

[0197] In an embodiment, as shown in FIG. **2**, FIG. **3**, FIG. **24**, and FIG. **25**, the disk generator **100** in the embodiments further includes a groove cover **82**, and the groove cover **82** is located between the flywheel **10** and the rotor **20** in the axial direction of the disk generator **100**. For example, refer to a diagram that is of a partial cross-sectional structure of the disk generator **100** according to an embodiment and that is shown in FIG. **27**. FIG. **27** is a diagram of the partial cross-sectional structure of FIG. **25**.

[0198] The groove cover **82** is ring-shaped. In the radial direction of the disk generator **100**, an outer diameter of the groove cover **82** is greater than a diameter of the inner peripheral wall of the groove **22**, and an inner diameter of the groove cover **82** is less than a diameter of the outer peripheral wall of the drive disk **41**. The groove cover **82** is fastened to a groove opening of the groove **22**, and the groove cover **82** is configured to shield a radial gap between the inner peripheral wall of the groove **22** and the outer peripheral wall of the drive disk **41**.

[0199] It may be understood that the groove cover **82** is fastened at the groove opening of the groove **22**, to shield the radial gap between the outer peripheral wall of the drive disk **41** and the inner peripheral wall of the groove **22**, so that the groove cover **82** can cooperate with the drive disk **41** to seal accommodation space for accommodating the circumferential buffer member **42**, leakage of the lubricant used to lubricate the circumferential buffer member **42** is prevented, content of the lubricant acting on the circumferential buffer member **42** is ensured, and the torsional vibration damper **40** is protected.

[0200] In this embodiment, the groove cover **82** is fastened to the rotor **20**. In some other embodiments, when the groove **12** is disposed on the second end face **11** of the flywheel **10**, the groove cover **82** is fastened to the flywheel **10**. Further, when the groove **12** is located on the second end face **11**, the groove cover **82** is configured to: shield the groove **12** on the flywheel **10**, and prevent the lubricant from overflowing into the rotor **20**, so that cooperative power generation between the rotor **20** and the stator **30** is not affected.

[0201] In an embodiment, as shown in FIG. **2**, FIG. **3**, FIG. **24**, and FIG. **25**, the disk generator **100** in the embodiments further includes an elastic baffle ring **83**. The elastic baffle ring **83** is located between the groove cover **82** and the drive disk **41** in the axial direction of the disk generator **100**. For example, refer to a diagram that is of a partial cross-sectional structure of the disk generator **100** according to an embodiment and that is shown in FIG. **28**. FIG. **28** is a diagram of the partial cross-sectional structure of FIG. **25**.

[0202] In the radial direction of the disk generator **100**, an outer diameter of the elastic baffle ring **83** is greater than an inner diameter of the groove cover **82**, and the inner diameter of the elastic baffle ring **83** is less than the diameter of the outer peripheral wall of the drive disk **41**. The elastic baffle ring **83** elastically abuts between the groove cover **82** and the drive disk **41** in the axial direction of the disk generator **100**, and the elastic baffle ring **83** is configured to shield an axial gap between the groove cover **82** and the drive disk **41**, to prevent the lubricant from leaking from

the gap between the groove cover **82** and the drive disk **41**, and further seal the groove **22**. Because the groove cover **82** may rotate relative to the drive disk **41**, the axial gap needs to be reserved between the groove cover **82** and the drive disk **41**, to avoid interference between the groove cover **82** and the drive disk **41** in a relative rotation process. The axial gap may cause overflow of the lubricant. Therefore, in the embodiments, the elastic baffle ring **83** is disposed to prevent overflow of the lubricant, ensure content of the lubricant oil acting on the circumferential buffer member **42**, and protect the torsional vibration damper **40**.
[0203] In an embodiment, refer back to FIG. **10** and FIG. **28**. An annular stop **413** is disposed on an end face that is of the drive disk **41** and that faces the groove cover **82**, and the annular stop **413** is configured to fasten an end face that is of the elastic baffle ring **83** and that faces the drive disk **41** in the axial direction of the disk generator **100**. It may be understood that, disposing of the annular stop **413** limits a position of the elastic baffle ring **83** in the radial direction of the disk generator **100**, to prevent the elastic baffle ring **83** from detaching in a running process of the disk generator **100** in the embodiments and affecting sealing performance on the groove **22**. This further ensures content of the lubricant acting on the circumferential buffer member **42**, and protects the torsional vibration damper **40**.
[0204] In an embodiment, the elastic baffle ring **83** is elastic in the axial direction of the disk generator **100**. In the axial direction of the disk generator **100**, two sides of the elastic baffle ring **83** are respectively configured to abut the drive disk **41** and the groove cover **82** to implement sealing. It may be understood that elasticity of the elastic baffle ring **83** in the axial direction of the disk generator **100** can still be used to seal the groove **22** when relative displacement is generated between the drive disk **41** and the groove cover **82** in the axial direction of the disk generator **100**. In addition, the elastic baffle ring **83** can further absorb axial force transmitted to the groove cover **82** through the drive disk **41**, to reduce noise and vibration in a running process of the disk generator **100** in the embodiments.
[0205] It is clear that a person skilled in the art can make various modifications and variations to the embodiments without departing from their scope. The embodiments are intended to cover these modifications and variations.

Claims

1. A disk generator integrated with a flywheel, comprising: the flywheel, a stator, and a rotor, the flywheel, the rotor, and the stator are sequentially arranged adjacent to each other in an axial direction of the disk generator, the flywheel is configured to: be in transmission connection to an engine, and drive the rotor to rotate through a torsional vibration damper, and the torsional vibration damper comprises a drive disk and a plurality of circumferential buffer members; a first end face of the rotor that faces the flywheel comprises a groove, and a second end face of the rotor that faces the flywheel is configured to fasten the drive disk of the torsional vibration damper, the groove is configured to accommodate the drive disk and the plurality of circumferential buffer members, each circumferential buffer member is configured to elastically connect the drive disk to the groove in a circumferential direction of the drive disk, the groove is configured to fasten a first end of the plurality of circumferential buffer members, and the drive disk is configured to fasten a second end of the plurality of circumferential buffer members.
2. The disk generator according to claim 1, wherein, in a circumferential direction of the disk generator, the plurality of circumferential buffer members is arranged at intervals between an outer peripheral wall of the drive disk and an inner peripheral wall of the groove; and, in a radial direction of the disk generator, two ends of each circumferential buffer member are respectively fastened to the inner peripheral wall of the groove and the outer peripheral wall of the drive disk.
3. The disk generator according to claim 1, wherein both the inner peripheral wall of the groove and the outer peripheral wall of the drive disk comprise a plurality of radial stoppers, each radial

stopper is configured to fasten one end of one circumferential buffer member, and the plurality of radial stoppers on the inner peripheral wall of the groove and the plurality of radial stoppers on the outer peripheral wall of the drive disk are arranged at intervals in the circumferential direction of the disk generator.

4. The disk generator according to claim 3, wherein, in the radial direction of the disk generator, a distance between each radial stopper on the inner peripheral wall of the groove and an axis of the drive disk is less than a distance between each radial stopper on the outer peripheral wall of the drive disk and the axis of the drive disk.

5. The disk generator according to claim 3, wherein, in an axial direction of the engine, the plurality of radial stoppers on the inner peripheral wall of the groove and the plurality of radial stoppers on the outer peripheral wall of the drive disk are arranged at intervals, and a sum of a thickness of each radial stopper on the inner peripheral wall of the groove and a thickness of each radial stopper on the outer peripheral wall of the drive disk is less than a depth of the groove.

6. The disk generator according to claim 3, wherein, in the circumferential direction of the disk generator, widths of each radial stopper are equal, and, in the radial direction of the disk generator, each radial stopper on the inner peripheral wall of the groove is aligned with a respective radial stopper on the outer peripheral wall of the drive disk.

7. The disk generator according to claim 3, wherein each circumferential buffer member further comprises: a circumferential spring, a first sliding block, and a second sliding block, wherein the first sliding block and the second sliding block are respectively fastened to two ends of the circumferential spring, the circumferential spring is configured to elastically connect the first sliding block and the second sliding block, a first sliding block is configured to fasten the radial stopper on the inner peripheral wall of the groove, and a second sliding block is configured to fasten the radial stopper on the outer peripheral wall of the drive disk.

8. The disk generator according to claim 7, wherein each circumferential spring further comprises: a plurality of segments of sub-springs sequentially arranged in the circumferential direction of the disk generator, the circumferential buffer member comprises a middle sliding block, and a middle sliding block is arranged between two adjacent segments of sub-springs in the circumferential direction of the disk generator.

9. The disk generator according to claim 7, wherein, in the axial direction of the disk generator, a thickness of each sliding block is greater than a distance between each radial stopper on the outer peripheral wall of the drive disk and a bottom of the groove.

10. The disk generator according to claim 7, wherein, in the axial direction of the disk generator, the thickness of each sliding block is less than or equal to the depth of the groove, and is greater than or equal to the sum of the thickness of each radial stopper on the inner peripheral wall of the groove and the thickness of each radial stopper on the outer peripheral wall of the drive disk.

11. The disk generator according to claim 1, further comprising: a housing that comprises a sleeve and an end cover that are connected to each other, wherein the end cover is arranged on a side of the stator that is away from the rotor in the axial direction of the disk generator, the end cover is configured to fasten the stator, the sleeve is sleeved on peripheries of the stator, the rotor, and the flywheel, an axial length of the sleeve is greater than a spacing between the flywheel and the end cover, and the sleeve is configured to shield an axial gap between the rotor and the flywheel.

12. The disk generator according to claim 1, further comprising: a motor shaft, wherein, in the axial direction of the disk generator, a first end of the motor shaft is configured to pass through the stator and is rotatably connected to the housing, a second end of the motor shaft comprises a bearing accommodating hole configured to accommodate a bearing; and an end face of the rotor that faces the flywheel comprises the groove, and the bearing is configured to be in coaxial transmission with the drive disk; or the end face that is of the flywheel and that faces the rotor comprises the groove, and the bearing is configured to be in coaxial transmission with the flywheel.

13. The disk generator according to claim 12, wherein the end face of the rotor that faces the flywheel comprises the groove, the bearing is configured to be in coaxial transmission with an axial connection portion of the drive disk, and the disk generator further comprises: a sealing ring fastened to the bottom of the groove, wherein an inner diameter of the sealing ring is greater than or equal to an outer diameter of the axial connection portion, and the sealing ring is configured to shield a radial gap between the axial connection portion and the rotor; or the generator comprises a groove cover, the groove cover is located between the flywheel and the rotor in the axial direction of the generator, an outer diameter of the groove cover is greater than a diameter of the inner peripheral wall of the groove, an inner diameter of the groove cover is less than a diameter of the outer peripheral wall of the drive disk, and the groove cover is fastened to a groove opening of the groove and is configured to shield a radial gap between the inner peripheral wall of the groove and the outer peripheral wall of the drive disk.

14. A hybrid powertrain comprising: a disk generator and an engine, wherein the disk generator comprises: a flywheel, a stator, and a rotor, the flywheel, the rotor, and the stator are sequentially arranged adjacent to each other in an axial direction of the disk generator, the flywheel is configured to: be in transmission connection to an engine, and drive the rotor to rotate through a torsional vibration damper, and the torsional vibration damper comprises: a drive disk and a plurality of circumferential buffer members, a first end face of the rotor that faces the flywheel comprises a groove, a second end face of the rotor that faces the flywheel is configured to fasten the drive disk of the torsional vibration damper, the groove is configured to accommodate the drive disk and the plurality of circumferential buffer members, each circumferential buffer member is configured to elastically connect the drive disk to the groove in a circumferential direction of the drive disk, the groove is configured to fasten a first end of the plurality of circumferential buffer members, and the drive disk is configured to fasten a second end of the plurality of circumferential buffer members; a crankshaft of the engine is connected to the flywheel of the disk generator, and the engine is configured to drive the flywheel to drive a rotor of the disk generator to rotate relative to a stator; or the drive motor is configured to rotate with a crankshaft of the engine, or is configured to drive wheels of a vehicle by using electric energy generated by the disk generator.

15. The hybrid powertrain according to claim 14, wherein, in a circumferential direction of the disk generator, the plurality of circumferential buffer members is arranged at intervals between an outer peripheral wall of the drive disk and an inner peripheral wall of the groove; and, in a radial direction of the disk generator, two ends of each circumferential buffer member are respectively fastened to the inner peripheral wall of the groove and the outer peripheral wall of the drive disk.

16. The hybrid powertrain according to claim 14, wherein both the inner peripheral wall of the groove and the outer peripheral wall of the drive disk comprise a plurality of radial stoppers, each radial stopper is configured to fasten one end of one circumferential buffer member; and the plurality of radial stoppers on the inner peripheral wall of the groove and the plurality of radial stoppers on the outer peripheral wall of the drive disk are arranged at intervals in the circumferential direction of the disk generator.

17. The hybrid powertrain according to claim 16, wherein, in the radial direction of the disk generator, a distance between each radial stopper on the inner peripheral wall of the groove and an axis of the drive disk is less than a distance between each radial stopper on the outer peripheral wall of the drive disk and the axis of the drive disk.

18. The hybrid powertrain according to claim 16, wherein, in an axial direction of the engine, the plurality of radial stoppers on the inner peripheral wall of the groove and the plurality of radial stoppers on the outer peripheral wall of the drive disk are arranged at intervals, and a sum of a thickness of each radial stopper on the inner peripheral wall of the groove and a thickness of each radial stopper on the outer peripheral wall of the drive disk is less than a depth of the groove.

19. The hybrid powertrain according to claim 16, wherein, in the circumferential direction of the disk generator, widths of each radial stopper are equal, and, in the radial direction of the disk generator, each radial stopper on the inner peripheral wall of the groove is aligned with a respective radial stopper on the outer peripheral wall of the drive disk.

20. A vehicle comprising: wheels, a power battery, and a hybrid powertrain; wherein the hybrid powertrain comprises; a disk generator, and an engine, wherein the disk generator comprises: a flywheel, a stator, and a rotor, the flywheel, the rotor, and the stator are sequentially arranged adjacent to each other in an axial direction of the disk generator, the flywheel is configured to: be in transmission connection to an engine, and drive the rotor to rotate through a torsional vibration damper, and the torsional vibration damper comprises: a drive disk and a plurality of circumferential buffer members, a first end face of the rotor that faces the flywheel comprises a groove, a second end face of the rotor that faces the flywheel is configured to fasten the drive disk of the torsional vibration damper, the groove is configured to accommodate the drive disk and the plurality of circumferential buffer members, each circumferential buffer member is configured to elastically connect the drive disk to the groove in a circumferential direction of the drive disk, the groove is configured to fasten a first end of the plurality of circumferential buffer members, the drive disk is configured to fasten a second other end of the plurality of circumferential buffer members, a crankshaft of the engine is connected to the flywheel of the disk generator, and the engine is configured to drive the flywheel to drive a rotor of the disk generator to rotate relative to a stator; or the drive motor is configured to rotate with a crankshaft of the engine, or is configured to drive wheels of a vehicle by using electric energy generated by the disk generator; an engine of the hybrid powertrain is further configured to directly drive the wheels; the power battery is configured to be charged by using electric energy generated by a disk generator.