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(54) VEHICLE STARTER AND TRANSMISSION MECHANISM FOR THE SAME

FAHRZEUGANLASSER UND GETRIEBEMECHANISMUS DAFÜR

DÉMARREUR DE VÉHICULE ET MÉCANISME DE TRANSMISSION

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(73) Proprietor: **SEG Automotive Germany GmbH**
70499 Stuttgart (DE)

(72) Inventors:
- **Stahl, Michael**
  410100 Changsha (CN)
- **Deng, Fangmin**
  PR China East No.6 Road, Xingsha, Changsha, Hunan province (CN)
- **Juraschka, Andreas**
  6700 Esbjerg (DK)

(74) Representative: **Steinbauer, Florian et al**
Dehns Germany
Theresienstraße 6-8
80333 München (DE)

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Description

Technical Field

[0001] The present invention relates to a vehicle starter having a transmission mechanism.

Background Art

[0002] In a modern vehicle, an electric starter is usually used to start an internal combustion engine of the vehicle. The starter is used to convert electrical energy stored in a rechargeable battery into mechanical energy which causes the engine of the vehicle to operate. In this way, the engine is started.

[0003] The starter is generally comprised of a direct-current (DC) electric motor, a transmission mechanism and a controller. When the engine of the vehicle is started, the electric motor is supplied with direct current from the battery to generate a torque. This torque is transmitted via the transmission mechanism to a ring gear on a flywheel of the engine such that a crankshaft of the engine is driven to rotate. The transmission mechanism comprises a speed reducer connected to an output shaft of the electric motor, an overrunning clutch connected to the speed reducer, an output shaft which is connected to the overrunning clutch at its inner end via a spline device, and a pinion which is mounted at an outer end of the output shaft of the transmission mechanism and is used to drive the ring gear. The spline device comprises an inner spline formed in the overrunning clutch and an outer spline formed at the inner end of the output shaft of the transmission mechanism for mating with the inner spline. The outer spline is movable axially relative to the inner spline. The controller is used to control operation of the electric motor and axial movement of the output shaft of the transmission mechanism so as to enable the pinion to engage with or disengage from the ring gear.

[0004] Figures 1a and 1b show a basic structure of the overrunning clutch of the transmission mechanism in a simple manner. The overrunning clutch generally comprises an outer sleeve 1, an inner sleeve 2 and rollers 3 disposed between the outer sleeve 1 and the inner sleeve 2. Involute structures 1.1 are provided on the outer sleeve 1 such that each roller 3, which is loaded by a respective spring 4, always contacts with surfaces of the outer sleeve 1 (i.e. the respective involute structure 1.1 thereon) and the inner sleeve 2. When the electric motor is activated, the output shaft of the electric motor drives the inner sleeve 2 to rotate, for example, in a clockwise direction such that each roller 3 tends to move towards a direction in which a gap between the involute structure 1.1 and the surface of the inner sleeve 2 is narrowed. Therefore, as a result of geometry of the involute structure 1.1, each roller 3 is compressed and clamped between the outer sleeve 1 and the inner sleeve 2. In this way, in terms of rotation transferring, the outer sleeve 1 is rigidly coupled to the inner sleeve 2 in the clockwise direction. That is, no relative movement can occur between the two sleeves in the clockwise direction. Therefore, the outer sleeve 1 of the overrunning clutch is driven to rotate in the clockwise direction.

[0005] Figure 1a shows how the overrunning clutch transmits the rotation in an ideal case. However, due to self-vibration of the overrunning clutch or force applied thereto, the outer sleeve 1 of the overrunning clutch is possibly not coaxial with the inner sleeve 2. In a case that the outer sleeve 1 is not coaxial with the inner sleeve 2, the overrunning clutch after being assembled will become an integrated member having input and output shafts which are not coaxial with each other. This case is illustrated in figure 1b. For example, if the outer sleeve 1 is influenced by radial vibrations, each roller 3 will be moved differently towards the direction in which the gap between the involute structure 1.1 and the surface of the inner sleeve 2 is narrowed. Therefore, a poor coaxiality between the outer sleeve 1 and the inner sleeve 2 is achieved. High-speed rotation of components which are not coaxial with each other can lead to a series of negative effects, such as a stronger impact on the component, lower efficiency of the starter and even a shorter service life of the starter.

[0006] Document US 2011247437A discloses a driving assembly for a vehicle starter. The driving assembly comprises a pinion, a spring, first and second snap rings, a damping element, a sleeve and bearings, wherein protrusions integrally formed on the sleeve are disposed in slots of the pinion such that it is driven to rotate. This kind of configuration is disadvantageous in that, if self-vibrations or force occur(s) as mentioned above; it is still hard to solve the problem that there is a poor coaxiality between the sleeve and the pinion.

[0007] Document US 4 899 604 A discloses a starter motor comprising a housing, an electric motor having an output rotary shaft and mounted within the housing, an over-running clutch axially slidably mounted on the output rotary shaft, a solenoid switch for shifting the over-running clutch, and a pinion shifter assembly.

Summary of the Invention

[0008] It is an object of the present invention to improve the transmission mechanism of the vehicle such that it can be manufactured simply and a perfect coaxiality is ensured.

[0009] According to one aspect of the present invention, vehicle starter with a transmission mechanism is provided, which comprises: a speed reducer connected to an output shaft of an electric motor of the vehicle starter ; an overrunning clutch connected to the speed reducer, the overrunning clutch having a driving part, a driven part and a movement transmitting element provided between the driving and driven parts for achieving transmission of a one-way movement therebetween; and an output shaft connected to the overrunning clutch, wherein the transmission mechanism further comprises

a transmission carrier, the overrunning clutch is connected to the speed reducer via the transmission carrier in such a way that rotational movement (that is, torque) is able to transmit only from the speed reducer to the overrunning clutch, the driving part of the overrunning clutch is mounted in the transmission carrier with play, and the transmission carrier is mounted on the output shaft of the electric motor.

[0010] Preferably, the play has a value between 0.2 millimeter and 0.8 millimeter, preferably of 0.5 millimeter.

[0011] According to the invention the driving part of the overrunning clutch has a projection in axial direction, the transmission carrier has a receiving slot in axial direction, and the projection is mounted in axial direction in the receiving slot with play, or the driving part of the overrunning clutch has a receiving slot in axial direction, the transmission carrier has a projection in axial direction, and the projection is mounted in axial direction in the receiving slot with play.

[0012] Preferably, a rubber piece is provided between the projection and the receiving slot.

[0013] Preferably, the rubber piece is provided with a hollow structure for absorbing vibration.

[0014] Optionally, the driving part of the overrunning clutch is an inner sleeve thereof, and the driven part of the overrunning clutch is an outer sleeve thereof.

[0015] Optionally, the driving part of the overrunning clutch is an outer sleeve thereof, and the driven part of the overrunning clutch is an inner sleeve thereof.

[0016] Preferably, the transmission carrier is mounted on the output shaft of the electric motor by a bearing.

[0017] According to technical solutions given by the description and claims, manufacturing difficulty and costs are both reduced because the driving part of the overrunning clutch requiring high rigidity is manufactured independently of the transmission carrier not requiring high rigidity. Further, because the driving part is connected to the transmission carrier with play so as to be driven to rotate, any non-coaxial effect between the driving and driven parts of the overrunning clutch caused by radial vibrations or impacts can be compensated. Improved efficiency and a prolonged servicing life of the vehicle starter can be obtained.

Brief Description of the Drawings

[0018]

Figure 1a schematically shows an overrunning clutch of a vehicle starter in a normal condition;

Figure 1b schematically shows the overrunning clutch of the vehicle starter in a case that a poor coaxiality occurs in the overrunning clutch.

Figure 2 schematically shows a cross-sectional view of a vehicle starter and its transmission mechanism according to a preferred embodiment of the present invention;

Figure 3 schematically shows an exploded view of an inner sleeve of the overrunning clutch according to the preferred embodiment;

Figure 4 is a cross-sectional view, schematically showing the inner sleeve of the overrunning clutch according to the preferred embodiment of the present invention is assembled onto a planet carrier; and

Figure 5 schematically shows an exploded and perspective view of an overrunning clutch according to another preferred embodiment of the present invention.

Detailed Description of Preferred Embodiments

[0019] Some preferred embodiments of the present invention are explained with respect to the attached drawings below.

[0020] Figure 2 shows a part of a vehicle starter according to a preferred embodiment of the present invention. The starter mainly comprises a DC electric motor 5, a transmission mechanism and a controller.

[0021] The electric motor 5 is installed in a housing of the starter. When an engine of the vehicle is started, the electric motor 5 is supplied with direct current from a rechargeable battery under controlling of the controller such that the electric motor 5 is operated to generate a torque. This torque is transmitted via the transmission mechanism to a ring gear on a flywheel of the engine in such a way that a crankshaft of the engine is driven to rotate.

[0022] The transmission mechanism mainly comprises a speed reducer 8 connected to an output shaft 5.1 of the electric motor 5, an overrunning clutch 9 connected to the speed reducer 8, an output shaft 7 whose inner end (adjacent the electric motor 5) is connected to the overrunning clutch 9 via a spline device 10, and a pinion 6 which is mounted at an outer end (far away from the electric motor 5) of the output shaft 7 and is used to drive the ring gear.

[0023] The speed reducer 8 can be a speed reducer of any form, for example, a gear speed reducer. According to one aspect of the present invention, a planetary gear speed reducer is illustrated in figure 2. The planetary gear speed reducer comprises a sun gear 8.1 mounted on the output shaft of the electric motor 5, an outer ring gear 8.2 mounted around the sun gear 8.1 fixedly and coaxially, and at least a planet gear 8.3 engaged between the sun gear and the outer ring gear. A central shaft 8.4 of the planet gear 8.3 is mounted on for example a planet carrier 12. When the sun gear 8.1 is driven by the output shaft of the electric motor 5 to rotate, the planet carrier outputs a rotational movement at a reduced speed.

[0024] The overrunning clutch 9 comprises an outer

sleeve 1, an inner sleeve 2 and a movement transmitting element 3, for example a roller between the outer and inner sleeves for transmitting a one-way movement therebetween. As shown in figures 1a and 1b, for example, a plurality of involute structures 1.1 can be provided in the outer sleeve 1. For instance, the involute structure can be in the form of an involute canal. One roller 3 and one spring 4 are allocated for each involute structure 1.1 such that one end of the spring 4 is fixed and the other end thereof pushes against the roller 3. Therefore, in each case, the roller 3 always contacts with both the outer sleeve 1 (that is, the involute structure thereon) and the inner sleeve 2.

[0025] As mentioned above, when the electric motor 5 is operated, the inner sleeve 2 of the overrunning clutch 9 is driven to rotate clockwisely for example. In this case, each roller 3 tends to move towards a direction in which the gap between the involute structure 1.1 and the inner sleeve is narrowed such that both the inner sleeve and the outer sleeve apply a pressure on the roller 3.

[0026] In this way, a rigid connection for example in the clockwise direction is established between the outer sleeve 1 and the inner sleeve 2 such that the torque is transmitted from the output shaft of the electric motor 5 to the output shaft 7 of the transmission mechanism and thus the crankshaft of the engine is driven to rotate.

[0027] After the engine is started, the output shaft 7, that is the outer sleeve 1 of the overrunning clutch 9 will be rotated at a speed higher than the inner sleeve 2. At this time, the rigid connection mentioned above will be lost between the outer sleeve 1 and the inner sleeve 2.

[0028] In the given embodiment, the movement transmitting element 3 of the overrunning clutch is the roller. However, it is understood that the movement transmitting element 3 can be embodied as any other suitable form which is well-known in the art, for example a wedge, a ratchet or the like.

[0029] Furthermore, in the illustrated embodiment, the inner sleeve 2 is constituted as a driving part of the overrunning clutch 9 and the outer sleeve 1 is constituted as a driven part of the overrunning clutch 9. However, alternatively, it is also possible that the outer sleeve 1 is constituted as the driving part and the inner sleeve 2 is constituted as the driven part.

[0030] The driven part of the overrunning clutch 9 transmits the rotational movement from the speed reducer 8 to the output shaft 7 via the spline device 10. As shown in figure 2, the spline device 10 comprises an inner spline part and an outer spline part mating therewith. The inner spline part is formed or mounted on the driven part (the outer sleeve 1 illustrated in figure 2) of the overrunning clutch 9. The outer spline part is formed or mounted at the inner end of the output shaft 7.

[0031] The output shaft 7 is supported by bearings 11 and 13 in the housing of the starter. The pinion 6 is mounted on the outer end of the output shaft 7. By axial movement of the output shaft 7, the pinion 6 can be engaged with or disengaged from the ring gear (not shown) on the flywheel of the engine. When the pinion 6 is engaged with the ring gear, the rotational movement and the torque generated by the electric motor 5 are transmitted to the ring gear successively via the speed reducer 8, the overrunning clutch 9, the spline device 10, the output shaft 7 and the pinion 6 such that the flywheel of the engine is driven to rotate and thus the engine can be started.

[0032] According to the prior art, the inner sleeve is usually integrated with the planet carrier. That is, a corresponding through hole is processed, for example machined, in the planet carrier, in which the central shaft of the planet gear is inserted so as to connect it to the planet carrier. In this way, the rotational movement is transmitted. However, this technical solution is disadvantageous in that the inner sleeve must be processed with hardness greatly higher than the planet carrier. Therefore, different heat processes are necessary for the same component, which leads to manufacturing difficulty thereof.

[0033] Moreover, in terms of the machining process, integrating the inner sleeve with the planet carrier leads to increase of component complexity. This also leads to manufacturing difficulty.

[0034] According to one aspect of the present invention, the inner sleeve 2 of the overrunning clutch is manufactured independently of the planet carrier 12. Then, they are assembled together. In this way, the heat process is necessary only for the inner sleeve of the overrunning clutch to increase its hardness, which obviously leads to simple manufacturing thereof.

[0035] Furthermore, as shown in figure 2, the planet carrier 12 is machined with a through hole at its center. The free end (i.e. the end adjacent the pinion 6) of the output shaft 5.1of the electric motor 5 is mounted in the central hole of the planet carrier 12 via a slide bearing 14. Therefore, because the free end of the output shaft 5.1 of the electric motor 5 is mounted in the central hole of the planet carrier 12 via the slide bearing 14, the coaxiality of the planet carrier itself relative to the output shaft of the electric motor is ensured. Meanwhile, a receiving slot is machined in the planet carrier to receive a protrusion protruding from the inner sleeve of the overrunning clutch such that the rotational movement is transmitted.

[0036] Although the slide bearing 14 is illustrated in figure 2, it is conceived that any other suitable bearing which achieves the same function, such as a needle bearing, a roller bearing or the like, can be adopted by the present invention.

[0037] Figure 3 shows the inner sleeve of the overrunning clutch and the planet carrier according to a preferred embodiment of the present invention in an exploded and perspective view. The inner sleeve 2 is substantially in the shape of a hollow cylinder. A circumferential flange 2.1 is formed on one side of the inner sleeve 2 adjacent the output shaft of the electric motor. A plurality of arc-shaped projections 2.2 are formed on the circumferential flange 2.1. In the illustrated embodiment, three arc-shaped projections 2.2 are shown for example. The plan-

et carrier 12 is shown as a rounded triangle shape. However, the planet carrier is not limited by this. For example, the planet carrier 12 can be circular, annular or the like.

[0038] A central hole 12.1 is machined at the center of the planet carrier 12 such that the output shaft of the electric motor is mounted in the central hole by the bearing 14. Additionally, three through holes 12.2 are machined in the planet carrier 12 to receive respective central shafts of planet gears of the planetary gear speed reducer. According to the preferred embodiment of the present invention, it is important that a plurality of arc-shaped receiving slots 12.3, for example three arc-shaped receiving slots are machined in the planet carrier 12 for mating with the projections 2.2 of the inner sleeve 2.

[0039] Figure 4 shows a cross-sectional view of the inner sleeve 2 assembled together with the planet carrier 12. Specifically, this figure shows an enlarged view of the dashed box illustrated in figure 2. As shown in figure 4, the central hole 12.1 of the planet carrier 12 receives the free end of the output shaft 5.1 by the bearing 14 in such a way that the coaxiality of the planet carrier 12 relative to the output shaft is ensured.

[0040] Preferably, each arc-shaped receiving slot 12.3 is machined with a size larger than the respective projection 2.2 or alternatively each projection 2.2 is machined with a size less than the respective arc-shaped receiving slot 12.3 such that each projection 2.2 is mounted in the arc-shaped receiving slot 12.3 with play.

[0041] A large number of experiments carried out by the inventor have proved that this kind of connection with play between the inner sleeve of the overrunning clutch and the planet carrier can effectively solve the problem that the coaxiality becomes poor due to radial vibrations.

[0042] In the technical solution of the present invention, the connection with play means that the size of the arc-shaped receiving slot is larger than that of the projection of the inner sleeve in each direction or the size of the projection of the inner sleeve is less than that of the arc-shaped receiving slot in each direction. That is, when the projection of the inner sleeve is received in the arc-shaped receiving slot, a clearance or play exists therebetween in a radial or circumferential direction of the planet carrier.

[0043] According to a large number of experiments carried out by the inventor, the technical problem that the coaxiality becomes poor can be perfectly solved if the clearance or play has a value of 0.5 millimeter. Optionally, the clearance or play can be selected in a range between 0.2 millimeter and 0.8 millimeter.

[0044] As mentioned above, the free end of the output shaft 5.1 is mounted in the central hole 12.1 of the planet carrier 12 by the bearing 14 such that the coaxiality of the planet carrier 12 itself is ensured. Further, the projection 2.2 of the inner sleeve 2 of the overrunning clutch is received in the receiving slot of the planet carrier 12 with play such that, when the rotational movement is transmitted, the projection can be moved somewhat in the receiving slot so as to counteract the negative effect caused by vibrations.

[0045] Although it is illustrated that the projection is formed on the inner sleeve of the overrunning clutch and the receiving slot is formed in the planet carrier, this arrangement can be reversed. That is, it is possible that the projection is formed on the planet carrier and the receiving slot is formed in the inner sleeve of the overrunning clutch.

[0046] Further, although the projection or the receiving slot is arc-shaped in the illustrated embodiment, it is conceived that they can be formed as other suitable shapes. For example, they can be circular, rectangular or the like as long as the projection or the receiving slot is sized as mentioned above in such a way that the projection can be received in the receiving slot with play.

[0047] Figure 5 shows an exploded and perspective view of another preferred embodiment of the present invention. In this figure, the inner sleeve 2 of the overrunning clutch, rubber pieces 15 and a planet carrier 12 are illustrated in an exploded manner. Each rubber piece 15 is shaped and sized to just receive the respective projection 2.2 of the inner sleeve 2 and at the same time to be received in a respective receiving slot 12.3 of the planet carrier 12.

[0048] The projection surrounded by the rubber piece is received in the receiving slot such that any impact from the engine of the vehicle is buffered and any vibration between the projection and the receiving slot can be reduced. Because the rubber piece is elastic, it can be deformed when the projection is received in the receiving slot. In this case, the inner sleeve of the overrunning clutch can also be considered to connect to the planet carrier with play. Except for this, the context about how the inner sleeve of the overrunning clutch and the planet carrier are arranged in the vehicle starter is the same as the embodiment of figure 2 and thus is omitted here.

[0049] In the embodiment illustrated by figure 5, the planet carrier is for example in the shape of a circle. A central hole is also provided at the center of the planet carrier. The bearing 14 mentioned above can be mounted in the central hole such that the output shaft 5.1 of the electric motor 5 can be mounted in the central hole by the bearing, as shown in figure 2. In this way, the coaxiality of the planet carrier 12 is ensured.

[0050] In this embodiment, each rubber piece 15 can be in the shape of an arc which corresponds with the projection 2.2 and the receiving slot 12.3. For instance, the arc-shaped rubber piece 15 is provided with an arc-shaped receiving slot 15.1 at its center to receive the projection 2.2 of the inner sleeve 2.

[0051] In order to allow the projection 2.2 to move in the receiving slot 12.3 more freely, a through hole 15.2 can be formed in the rubber piece at either side of the receiving slot 15.1. In this way, like the embodiment mentioned above, the overrunning clutch can be connected to the planet carrier 12 with play while any vibration is avoided.

[0052] Similarly, if the projection or the receiving slot

is formed as other shapes such as circle rectangle or the like, the rubber piece 15 can be formed correspondingly such that the rubber piece is adaptable to receive the projection of the inner sleeve of the overrunning clutch and at the same time to be received in the receiving slot of the planet carrier.

[0053] Alternatively, except for the projection and the receiving slot mentioned above, any other suitable structure, which achieves a connection with play between the inner sleeve and the planet carrier and transmits movement therebetween, can be adopted by the present invention. For example, such structure can be a key-slot structure. The key-slot structure comprises a key and a slot which are provided to the inner sleeve and the planet carrier respectively and are sized to achieve the connection with play between the inner sleeve and the planet carrier. In this case, alternatively, the rubber piece can be provided as a block between the key and the slot.

[0054] In the illustrated embodiments, the coaxiality of the planet carrier is ensured by the output shaft of the electric motor being mounted in the central hole of the planet carrier. It is feasible to ensure the coaxiality by other suitable solutions. For instance, a reference site can be machined in the housing of the starter in advance. Then, the planet carrier is for example mounted at the reference site to ensure its coaxiality, and other components are assembled with respect to the reference site. In this way, the planet carrier can be provided with the receiving slot or the projection mentioned above to engage with the corresponding projection or receiving slot of the inner sleeve of the overrunning clutch such that the planet carrier is connected to the inner sleeve with play. Therefore, any poor coaxiality of the planet carrier relative to the inner sleeve caused by radial vibrations can be counteracted or compensated.

[0055] Although the planetary gear speed reducer is used in the specific embodiments of the present invention to explain the overrunning clutch, it is conceived that any other speed reducer, for example a gearbox, can be used. In this case, the planet carrier can be replaced with a transmission carrier. This transmission carrier is embodied in a similar manner as the planet carrier. However, this transmission carrier will be mounted on an output shaft of the gearbox. In this way, the coaxiality of the transmission carrier relative to the inner sleeve of the overrunning clutch can be ensured. At the same time, because the transmission carrier is provided with the receiving slot or projection mentioned above to engage with a corresponding structure in the inner sleeve of the overrunning clutch, any vibration or deviation occurring during operation of the engine can be compensated.

[0056] The transmission mechanism according to the present invention is adapted to starters of various vehicles, for example a starter for a diesel engine.

[0057] Although the present invention has been explained by the schematic embodiments, the skilled in the art will understand that various modifications to those embodiments are possible without departing from the scope of the present invention defined by the attached claims and their equivalents.

Claims

1. A vehicle starter, comprising:
   an electric motor (5) and a transmission mechanism having:

   a speed reducer (8) connected to an output shaft (5.1) of the electric motor (5);
   an overrunning clutch (9) connected to the speed reducer (8), the overrunning clutch (9) having a driving part, a driven part and a movement transmitting element (3) provided between the driving and driven parts for achieving transmission of a one-way movement therebetween; and
   an output shaft (7) connected to the overrunning clutch (9),
   wherein the transmission mechanism further comprises a transmission carrier (12), the overrunning clutch (9) is connected to the speed reducer (8) via the transmission carrier (12) in such a way that rotational movement is able to transmit only from the speed reducer (8) to the overrunning clutch (9), the driving part of the overrunning clutch (9) is mounted in the transmission carrier (12) with radial or circumferential play, and the transmission carrier (12) is mounted on the output shaft (5.1) of the electric motor (5),
   wherein the driving part of the overrunning clutch (9) has a projection (2.2) in axial direction, the transmission carrier (12) has a receiving slot (12.3) in axial direction, and the projection (2.2) is mounted in axial direction in the receiving slot (12.3) with radial or circumferential play or
   wherein the driving part of the overrunning clutch (9) has a receiving slot in axial direction, the transmission carrier (12) has a projection in axial direction, and the projection is mounted in axial direction in the receiving slot with radial or circumferential play.

2. The vehicle starter according to claim 1, wherein the play has a value between 0.2 millimeter and 0.8 millimeter, preferably of 0.5 millimeter.

3. The vehicle starter according to claim 1 or 2, wherein a rubber piece (15) is provided between the projection (2.2) and the receiving slot (12.3).

4. The vehicle starter according to claim 3, wherein the rubber piece (15) is provided with a hollow structure for absorbing vibration.

5. The vehicle starter according to any one of the pre-

ceding claims, wherein the driving part of the overrunning clutch (9) is an inner sleeve (2) thereof, and the driven part of the overrunning clutch is an outer sleeve (1) thereof.

6. The vehicle starter according to any one of claims 1 to 4, wherein the driving part of the overrunning clutch (9) is an outer sleeve (1) thereof, and the driven part of the overrunning clutch is an inner sleeve (2) thereof.

7. The vehicle starter according to any one of the preceding claims, wherein the transmission carrier (12) is mounted on the output shaft (5.1) of the electric motor (5) by a bearing (14).

Patentansprüche

1. Ein Fahrzeugstarter, aufweisend:
einen Elektromotor (5) und ein Getriebemechanismus mit:

einem Untersetzungsgetriebe (8), das mit einer Abtriebswelle (5.1) des Elektromotors (5) verbunden ist;
einer Freilaufkupplung (9), die mit dem Untersetzungsgetriebe (8) verbunden ist, wobei die Freilaufkupplung (9) einen antreibenden Teil, einen angetriebenen Teil und ein eine Bewegung übertragendes Element (3) hat, das zwischen den antreibenden und angetriebenen Teilen vorgesehen ist, um eine Übertragung einer einseitigen Bewegung dazwischen zu erreichen; und
einer Abtriebswelle (7), die mit der Freilaufkupplung (9) verbunden ist,

wobei der Getriebemechanismus ferner einen Getriebeträger (12) aufweist, die Freilaufkupplung (9) mit dem Untersetzungsgetriebe (8) über den Getriebeträger (12) derart verbunden ist, dass Rotationsbewegung nur von dem Untersetzungsgetriebe (8) auf die Freilaufkupplung (9) übertragen kann, der antreibende Teil der Freilaufkupplung (9) in dem Getriebeträger (12) mit radialem oder in Umfangsrichtung verlaufendem Spiel angeordnet ist, und der Getriebeträger (12) an der Abtriebswelle (5.1) des Elektromotors (5) angeordnet ist,
wobei der antreibende Teil der Freilaufkupplung (9) einen Vorsprung (2.2) in axialer Richtung hat, der Getriebeträger (12) eine aufnehmende Aussparung (12.3) in axialer Richtung hat, und der Vorsprung (2.2) in axialer Richtung in der aufnehmenden Aussparung (12.3) mit radialem oder in Umfangsrichtung verlaufendem Spiel angeordnet ist oder
wobei der antreibende Teil der Freilaufkupplung (9) eine aufnehmende Aussparung in axialer Richtung hat, der Getriebeträger (12) einen Vorsprung in axialer Richtung hat, und der Vorsprung in axialer Richtung in der aufnehmenden Aussparung mit radialem oder in Umfangsrichtung verlaufendem Spiel angeordnet ist.

2. Der Fahrzeugstarter nach Anspruch 1, wobei das Spiel einen Wert zwischen 0,2 Millimeter und 0,8 Millimeter hat, vorzugsweise von 0,5 Millimeter.

3. Der Fahrzeugstarter nach Anspruch 1 oder 2, wobei ein Gummistück (15) zwischen dem Vorsprung (2.2) und der aufnehmenden Aussparung (12.3) vorgesehen ist.

4. Der Fahrzeugstarter nach Anspruch 3, wobei das Gummistück (15) mit einer hohlen Struktur vorgesehen ist, um Schwingungen zu absorbieren.

5. Der Fahrzeugstarter nach einem der vorstehenden Ansprüche, wobei der antreibende Teil der Freilaufkupplung (9) eine innere Hülse (2) davon ist und der angetriebene Teil der Freilaufkupplung eine äußere Hülse (1) davon.

6. Der Fahrzeugstarter nach einem der Ansprüche 1 bis 4, wobei der antreibende Teil der Freilaufkupplung (9) eine äußere Hülse (1) davon ist und der angetriebene Teil der Freilaufkupplung eine innere Hülse (2) davon.

7. Der Fahrzeugstarter nach einem der vorstehenden Ansprüche, wobei der Getriebeträger (12) an der Abtriebswelle (5.1) des Elektromotors (5) durch ein Lager (14) angeordnet ist.

Revendications

1. Démarreur de véhicule, comportant :
un moteur électrique (5) et un mécanisme de transmission ayant :

un réducteur de vitesse (8) relié à un arbre de sortie (5.1) du moteur électrique (5) ;
un lanceur à roue libre (9) relié au réducteur de vitesse (8), le lanceur à roue libre (9) ayant une partie motrice, une partie entraînée et un élément transmetteur de mouvement (3) agencé entre les parties motrice et entraînée pour réaliser la transmission d'un mouvement unidirectionnel entre celles-ci ; et
un arbre de sortie (7) relié au lanceur à roue libre (9), dans lequel le mécanisme de transmission comporte en outre un support de transmission (12), le lanceur à roue libre (9) est relié au réducteur de vitesse (8) via le support de transmission (12) de telle manière que le mouvement

de rotation ne peut se transmettre que du réducteur de vitesse (8) au lanceur à roue libre (9), la partie motrice du lanceur à roue libre (9) est montée dans le support de transmission (12) avec un jeu radial ou circonférentiel, et le support de transmission (12) est monté sur l'arbre de sortie (5.1) du moteur électrique (5),
dans lequel la partie motrice du lanceur à roue libre (9) a une saillie (2.2) dans une direction axiale, le support de transmission (12) a une fente de réception (12.3) dans la direction axiale, et la saillie (2.2) est reçue, dans la direction axiale, dans la fente de réception (12.3) avec un jeu radial ou circonférentiel ou
dans lequel la partie motrice du lanceur à roue libre (9) a une fente de réception dans la direction axiale, le support de transmission (12) a une saillie dans la direction axiale, et la saillie est reçue, dans la direction axiale, dans la fente de réception avec un jeu radial ou circonférentiel.

2. Démarreur de véhicule selon la revendication 1, dans lequel le jeu a une valeur comprise entre 0,2 millimètre et 0,8 millimètre, de préférence égale à 0,5 millimètre.

3. Démarreur de véhicule selon la revendication 1 ou 2, dans lequel une pièce en caoutchouc (15) est agencée entre la saillie (2.2) et la fente de réception (12.3).

4. Démarreur de véhicule selon la revendication 3, dans lequel la pièce en caoutchouc (15) est pourvue d'une structure creuse pour absorber les vibrations.

5. Démarreur de véhicule selon l'une quelconque des revendications précédentes, dans lequel la partie motrice du lanceur à roue libre (9) est un manchon intérieur (2) de celle-ci, et la partie entraînée du lanceur à roue libre est un manchon extérieur (1) de celle-ci.

6. Démarreur de véhicule selon l'une quelconque des revendications 1 à 4, dans lequel la partie motrice du lanceur à roue libre (9) est un manchon extérieur (1) de celle-ci, et la partie entraînée du lanceur à roue libre est un manchon intérieur (2) de celle-ci.

7. Démarreur de véhicule selon l'une quelconque des revendications précédentes, dans lequel le support de transmission (12) est monté sur l'arbre de sortie (5.1) du moteur électrique (5) par un palier (14).

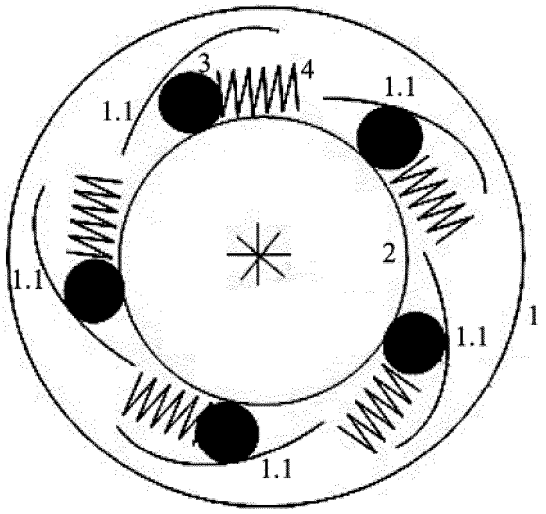

Figure 1a

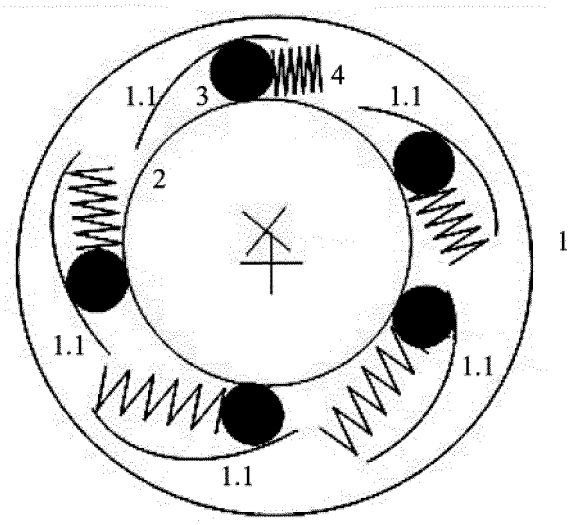

Figure 1b

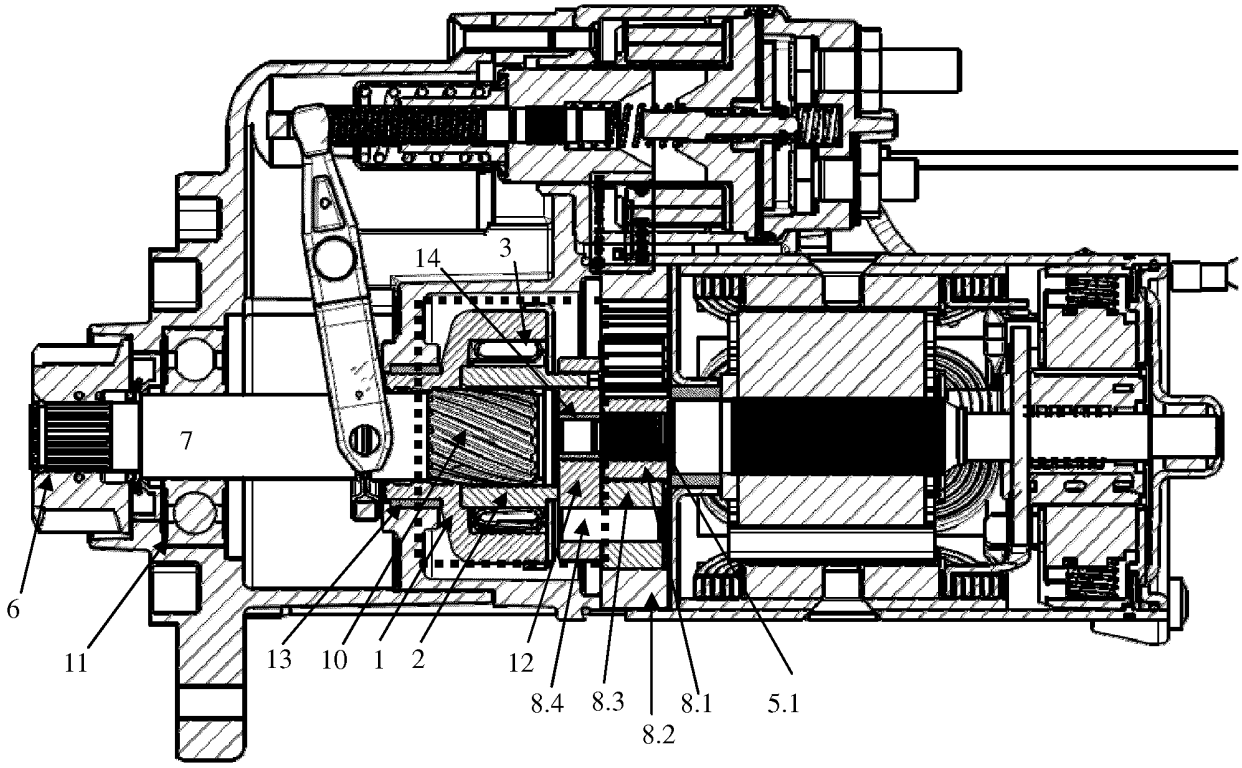

Figure 2

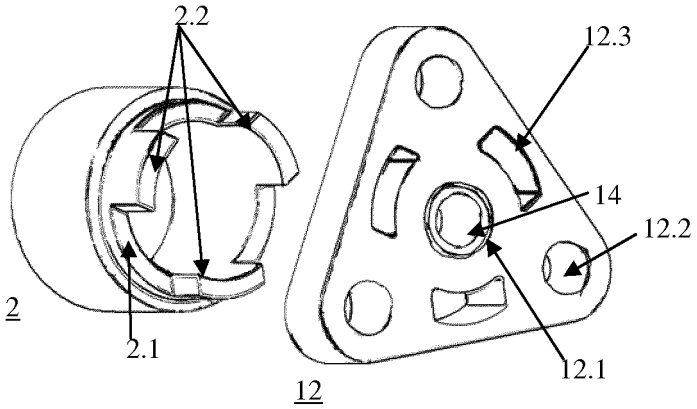

Figure 3

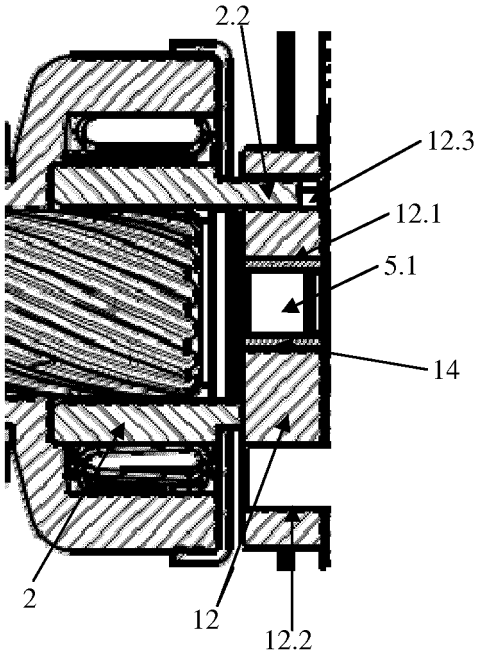

Figure 4

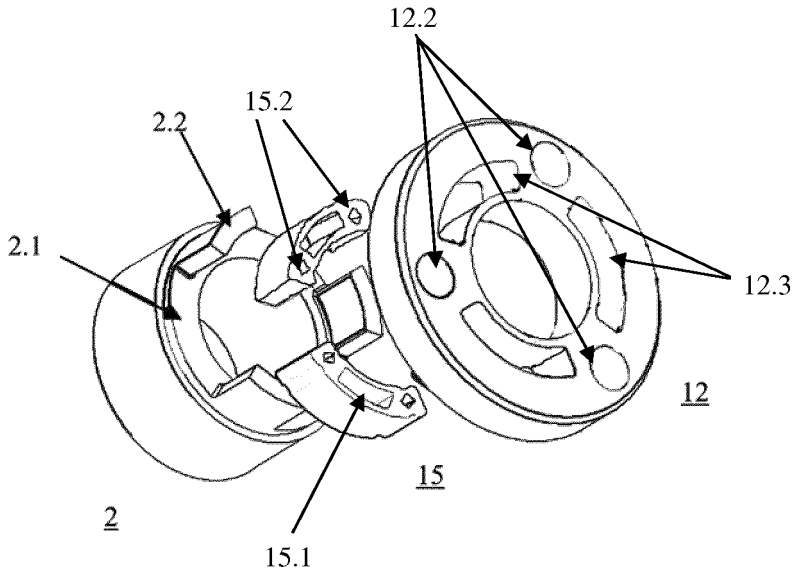

Figure 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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