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(54) Title: PASSIVE RATIO CONTROL METHODS FOR A BALL-TYPE PLANETARY TRANSMISSION

(57) Abstract: Provided herein is a passive ratio control system for a ball-type continuously variable transmission having a fixed carrier and a rotatable carrier configured to provide a means to adjust the ratio of the transmission. The passive control system is configured to change the rotatable carrier position relative to the torque being transmitted through the transmission. In some embodiments, a spring is operably coupled to the rotatable carrier to thereby provide a reaction force proportional to transmitted torque. In other embodiments, a number of springs are used to control the position of the rotatable carrier with respect to the fixed carrier to thereby control the ratio of the transmission.



PASSIVE RATIO CONTROL METHODS FOR A BALL-TYPE PLANETARY TRANSMISSION

RELATED APPLICATION

5 The present application claims the benefit of U.S. Provisional Application No. 62/481,733 filed on April 5, 2017, which is incorporated herein by reference in its entirety.

BACKGROUND

10 Continuously variable transmissions (CVT) and transmissions that are substantially continuously variable are increasingly gaining acceptance in various applications. The process of controlling the ratio provided by the CVT is complicated by the continuously variable or minute gradations in ratio presented by the CVT. Furthermore, the range of ratios that are available to be
15 implemented in a CVT are not sufficient for some applications. Typical ball variator systems used today consist of a fixed carrier, power going in one ring and out of the second ring, and the sun acting as an idler. The control of ratio is accomplished by skewing the axis of the planets by splitting the fixed carrier into two halves that can be rotated relative to each other to produce the skew
20 angle. This is typically done by fixing one half of the carrier and then attaching an actuator to the other half to control the relative rotational position between the two. A sensor for the position of the moveable carrier half is used to feed back the position of the moveable carrier to a controller. Also, speed sensors are typically used to get the speeds of the rings to determine ratio as an
25 additional feed back to the controller. However, electronic feedback control systems are not economically feasible for a variety of vehicle applications. There is a need for a control system that replaces an electronic or hydraulic actuator, sensors, or a controller with simple and inexpensive mechanical elements.

SUMMARY

30 Provided herein is a passive ratio control system for a continuously variable planetary (CVP) having a first traction ring assembly and a second

traction ring assembly in contact with a plurality of balls, wherein each ball of the plurality of balls has a tiltable axis of rotation, wherein the tiltable axis of rotation is supported by a first carrier member and a second carrier member, wherein the second carrier member is configured to rotate with respect to the first carrier member corresponding to a change in the tiltable axis of rotation. The passive ratio control system includes: a first spring member operably coupled to the second carrier member; and a second spring member operably coupled to the second carrier member, wherein the first spring member is configured to provide a reaction force in a first direction and the second spring member is configured to provide a reaction force in a second direction, wherein the second direction is opposite of the first direction; and wherein the first spring member and the second spring member are configured to control the rotational position of the second carrier member with respect to the first carrier member to thereby control a speed ratio of the CVP proportional to an operating torque.

In some embodiments of the passive control system the first spring member and the second spring member are torsional springs.

In some embodiments, the passive control system further includes a first damper operably coupled to the first spring member.

In some embodiments, the passive control system further includes a second damper operably coupled to the second spring member.

In some embodiments of the passive control system a positive operating torque corresponds to a change in the CVP speed ratio towards a reduction.

In some embodiments of the passive control system a negative operating torque corresponds to a change in the CVP speed ratio towards an overdrive condition.

In some embodiments of the passive control system the second carrier member supports a number of spring elements.

In some embodiments of the passive control system the spring elements are coupled to a grounded member.

In some embodiments of the passive control system the spring elements are coupled to the first carrier member.

In some embodiments of the passive control system the first spring member is integrated in to the first carrier member and the second spring member is integrated into the second carrier member.

Provided herein is a vehicle including g a CVP and a passive control system
5 described herein.

In some embodiments, the vehicle further includes an electric motor operably coupled to the CVP.

INCORPORATION BY REFERENCE

10 All publications, patents, and patent applications mentioned in this specification are herein incorporated by reference to the same extent as if each individual publication, patent, or patent application was specifically and individually indicated to be incorporated by reference.

BRIEF DESCRIPTION OF THE DRAWINGS

15 Novel features of the preferred embodiments are set forth with particularity in the appended claims. A better understanding of the features and advantages of the present embodiments will be obtained by reference to the following detailed description that sets forth illustrative embodiments, in
20 which the principles of the devices are utilized, and the accompanying drawings of which:

Figure 1 is a side sectional view of a ball-type variator.

Figure 2 is a plan view of a carrier member that used in the variator of
Figure 1.

25 Figure 3 is an illustrative view of different tilt positions of the ball-type variator of Figure 1.

Figure 4 is a schematic diagram of a ball-type continuously variable transmission equipped with a passive ratio control system.

Figure 5 is a detailed view A of the ball-type continuously variable
30 transmission of Figure 4.

Figure 6 is a graph depicting an exemplary electric motor torque versus speed relationship.

Figure 7 is a graph of carrier reaction torque versus speed ratio for an exemplary passive ratio control system.

Figure 8 is a schematic diagram of a carrier member of the continuously variable transmission equipped with a passive ratio control system.

5

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A passive ratio control device is described herein that enables control over a variable ratio transmission having a continuously variable ratio portion, such as a Continuously Variable Transmission (CVT), Infinitely Variable Transmission (IVT), or variator. Provided herein are configurations of CVTs based on a ball-type variator, also known as CVP, for continuously variable planetary. Basic concepts of a ball-type Continuously Variable Transmissions are described in United States Patent No. 8,469,856 and 8,870,711 incorporated herein by reference in their entirety. Such a CVT, adapted herein as described throughout this specification, includes a number of balls (planets, spheres) 1, depending on the application, two ring (disc) assemblies with a conical surface contact with the balls, as input (first) traction ring assembly 2 and output (second) traction ring assembly 3, and an idler (sun) assembly 4 as shown on FIG. 1.

20 In some embodiments, the output traction ring assembly 3 includes an axial force generator mechanism. The balls are mounted on tiltable axles 5, themselves held in a carrier (stator, cage) assembly having a first carrier member 6 operably coupled to a second carrier member 7. The first carrier member 6 rotates with respect to the second carrier member 7, and vice versa.

25 In some embodiments, the first carrier member 6 is substantially fixed from rotation while the second carrier member 7 is configured to rotate with respect to the first carrier member, and vice versa.

In one embodiment, the first carrier member 6 is provided with a number of radial guide slots 8.

30 The second carrier member 7 is provided with a number of radially offset guide slots 9, as illustrated in FIG. 2. The radial guide slots 8 and the radially offset guide slots 9 are adapted to guide the tiltable axles 5. The axles 5 are

adjustable to achieve a desired ratio of input speed to output speed during operation of the CVT.

In some embodiments, adjustment of the axles 5 involves control of the position of the first 6 and second carrier members 7 to impart a tilting of the axles 5 and thereby adjusts the speed ratio of the variator. Other types of ball CVTs also exist, like the one produced by Milner, but are slightly different.

The working principle of such a CVP of FIG. 1 is shown on FIG. 3. The CVP itself works with a traction fluid. The lubricant between the ball and the conical rings acts as a solid at high pressure, transferring the power from the input ring, through the balls, to the output ring. By tilting the balls' axes, the ratio is changed between input and output. When the axis is horizontal, the ratio is one, as illustrated in FIG. 3, when the axis is tilted, the distance between the axis and the contact point change, modifying the overall ratio. All the balls' axes are tilted at the same time with a mechanism included in the carrier assembly and/or idler assembly.

Embodiments disclosed herein are related to the control of a variator and/or a CVT using generally spherical planets each having a tiltable axis of rotation that is adjustable to achieve a desired ratio of input speed to output speed during operation.

In some embodiments, adjustment of said axis of rotation involves angular misalignment of the planet axis in a first plane in order to achieve an angular adjustment of the planet axis in a second plane that is substantially perpendicular to the first plane, thereby adjusting the speed ratio of the variator. The angular misalignment in the first plane is referred to here as "skew", "skew angle", and/or "skew condition".

In one embodiment, a control system coordinates the use of a skew angle to generate forces between certain contacting components in the variator that will tilt the planet axis of rotation. The tilting of the planet axis of rotation adjusts the speed ratio of the variator.

As used here, the terms "operationally connected", "operationally coupled", "operationally linked", "operably connected", "operably coupled", "operably coupleable", "operably linked," and like terms, refer to a relationship (mechanical, linkage, coupling, etc.) between elements whereby operation of

one element results in a corresponding, following, or simultaneous operation or actuation of a second element. It is noted that in using said terms to describe inventive embodiments, specific structures or mechanisms that link or couple the elements are typically described. However, unless otherwise specifically
5 stated, when one of said terms is used, the term indicates that the actual linkage or coupling will take a variety of forms, which in certain instances will be readily apparent to a person of ordinary skill in the relevant technology.

For description purposes, the term “radial”, as used herein indicates a direction or position that is perpendicular relative to a longitudinal axis of a
10 transmission or variator. The term “axial” as used herein refers to a direction or position along an axis that is parallel to a main or longitudinal axis of a transmission or variator.

It should be noted that reference herein to “traction” does not exclude applications where the dominant or exclusive mode of power transfer is through
15 “friction”. Without attempting to establish a categorical difference between traction and friction drives herein, generally, these are understood as different regimes of power transfer. Traction drives usually involve the transfer of power between two elements by shear forces in a thin fluid layer trapped between the elements. The fluids used in these applications usually exhibit traction
20 coefficients greater than conventional mineral oils. The traction coefficient (μ) represents the maximum available traction forces that would be available at the interfaces of the contacting components and is a measure of the maximum available drive torque. Typically, friction drives generally relate to transferring power between two elements by frictional forces between the elements.

For the purposes of this disclosure, it should be understood that the
25 CVTs described here could operate in both tractive and frictional applications. As a general matter, the traction coefficient μ is a function of the traction fluid properties, the normal force at the contact area, and the velocity of the traction fluid in the contact area, among other things. For a given traction fluid, the
30 traction coefficient μ increases with increasing relative velocities of components, until the traction coefficient μ reaches a maximum capacity after which the traction coefficient μ decays. The condition of exceeding the maximum capacity of the traction fluid is often referred to as “gross slip

condition". Traction fluid is also influenced by entrainment speed of the fluid and temperature at the contact patch, for example, the traction coefficient is generally highest near zero speed and decays as a weak function of speed. The traction coefficient often improves with increasing temperature until a point at which the traction coefficient rapidly degrades.

As used herein, "creep", "ratio droop", or "slip" is the discrete local motion of a body relative to another and is exemplified by the relative velocities of rolling contact components such as the mechanism described herein. In traction drives, the transfer of power from a driving element to a driven element via a traction interface requires creep. Usually, creep in the direction of power transfer, is referred to as "creep in the rolling direction." Sometimes the driving and driven elements experience creep in a direction orthogonal to the power transfer direction, in such a case this component of creep is referred to as "transverse creep."

Referring now to FIGS. 4 and 5, in some embodiments, a ball-type continuously variable transmission 10 includes a fixed carrier member 12 and a rotatable carrier member 14 configured to support a number of balls 16. Each ball 16 is provided with a ball axle 18. The ball axle 18 is coupled to the fixed carrier member 12 at one end and coupled to the rotatable carrier member 14 at a distal end. The ball-type continuously variable transmission 10 is configured in a substantially similar manner as the CVT depicted in FIGS. 1-3.

In some embodiments, the transmission 10 is provided with a passive ratio control system 22. The passive ratio control system 22 is operably coupled to the rotatable carrier member 14.

Turning specifically to Figure 5, in some embodiments, the passive ratio control system 22 includes a first spring member 23 coupled to the rotatable carrier member 14 and a grounded member such as a housing (not shown). The passive ratio control system 22 includes a second spring member 24 coupled to the rotatable carrier member 14 and the ground member.

The first spring member 23 and the second spring member 24 are positioned to provide opposing reaction force to the rotatable carrier member 14.

In some embodiments, the first spring member 23 is positioned parallel to and directly opposing the second spring member 24.

In some embodiments, the first spring member 23 is configured to provide a reaction force corresponding an input torque in a positive direction.

5 The second spring member 24 is configured to provide a reaction force corresponding to an input torque in a negative direction.

In some embodiments, the first spring member 23 and the second spring member 24 are configured to provide a torsional spring rate between the first carrier member 12 and the second carrier member 14.

10 In some embodiments, the passive ratio control system 22 is provided with a first damper 25. In some embodiments, the passive ratio control system 22 is provided with a second damper 26.

The first damper 25 and/or the second damper 26 are optionally configured to provide a delay in response to the change in torque transmitted through the drive and the change in ratio provided by the first spring member 23 and the second spring member 24. For example, sudden changes in transmitted torque may be caused by torque spikes in the power source, or a vehicle running over an obstacle in the road.

15 In some embodiments, the first spring member 23 is a torsion type spring. The spring member can be coupled to a grounded member or to the second carrier member 14. The torsional rate between the first and second carrier members 12, 14 are optionally configured to have a constant spring rate, variable spring rate, non-linear spring rate, multiple spring rate, among others.

25 In some embodiments, the first damper 25 and the second damper 26 are configured to be constant damping rate, variable damping rate, non-linear damping rate, and multiple damping rate, among others.

During operation of the transmission 10, the first spring member 23 and the second spring member 24 are configured to position the rotatable carrier member 14 at a pre-determined position corresponding to a speed ratio when no torque is being transmitted.

30 In some embodiments, the pre-determined positions is a zero torque condition or unloaded operating condition.

In some embodiments, the pre-determined position corresponds to a speed ratio near 1:1.

As positive torque is applied to the transmission 10, from a source of rotational power (not shown), the rotatable carrier member 14 will have a torsional force that urges the rotatable carrier member 14 in the direction that results in a down ratio or reduction. The rotatable carrier member 14 moves towards the reduction direction until the resulting torque on the rotatable carrier member 14 produced by the torque through the drive equals the force produced by the first spring member 23 and the second spring member 24.

Under certain operating conditions, the rotatable carrier member 14 moves towards reduction until the rotatable carrier member 14 reaches a physical limit or shift stop.

In some embodiments, the first spring member 23 and the second spring member 24 are configured to produce the maximum reduction ratio when the maximum torque from the power source is applied.

As a vehicle equipped with the transmission 10 accelerates to a cruising speed, the required torque is reduced and the drive will ratio towards the 1 to 1 ratio, or the pre-determined position for the zero torque condition. As the vehicle coasts to a stop the ratio will move towards overdrive.

Passing now to FIG. 6, and exemplary application of the passive ratio control system 22 will be discussed in reference to the graph 30.

In some embodiments, the passive ratio control system 22 is used in vehicles equipped with an electric motor drive as the source of rotational power. In the constant torque region 31 on the graph 30, the transmission 10 reduces the ratio to provide maximum starting torque. As the vehicle speeds up from launch, the electric motor transitions into the constant power region 32 on the graph 30, and the transmission 10 changes ratio towards overdrive as the available torque reduces with speed. The first spring member 23 and the second spring member 24 are optionally adjusted to result in a ratio within the most efficient region of operation for the transmission 10 as well as the most efficient region of the motor operation.

Referring now to FIG. 7, a graph 40 depicts a relationship between a reaction torque on the fixed carrier 12 and a reaction torque on the rotatable

carrier 14 as a function of speed ratio for a constant input torque to the transmission 10. It should be appreciated that either carrier member 12, 14 to be the rotatable carrier member. Because the torque profile is different between the two carrier members 12, 14, by selecting which carrier member 12, 14 is rotatable a desired ratio can be achieved.

The type and torsional rate of the spring members, for example the first spring member 23 and the second spring member 24, effects the relationship of the speed ratio verses torque. The addition of a damper, such as the first damper 25 or the second damper 26, provides an option to tune the response of the passive ratio control system 22.

Referring now to FIG. 8, in some embodiments the carrier member 14 is adapted to support a number of spring elements 170. The spring elements 170 are coupled to a grounded member, such as a transmission housing, or optionally coupled to the carrier member 12 (not shown).

In some embodiments, the first spring member 23 or the second spring member 24 is integrated into the carrier members 12, 14 to provide a torsional spring rate between the first carrier member 12 and the second carrier member 14.

Provided herein is a vehicle including the transmission 10 embodiments described above, or obvious to one of skill in the art upon reading the disclosures herein.

Embodiments of the transmission 10 described herein or that would be obvious to one of skill in the art upon reading the disclosure herein are contemplated for use in a variety of vehicle drivelines.

For non-limiting example, the variable transmissions disclosed herein may be used in bicycles, mopeds, scooters, motorcycles, automobiles, electric automobiles, trucks, sport utility vehicles (SUV's), lawn mowers, tractors, harvesters, agricultural machinery, all terrain vehicles (ATV's), jet ski's, personal watercraft vehicles, airplanes, trains, helicopters, buses, forklifts, golf carts, motorships, steam powered ships, submarines, space craft, or other vehicles that employ a transmission.

While the figures and description herein are directed to ball-type variators (CVTs), alternate embodiments are contemplated another version of a

variator (CVT), such as a Variable-diameter pulley (VDP) or Reeves drive, a toroidal or roller-based CVT (Extroid CVT), a Magnetic CVT or mCVT, Ratcheting CVT, Hydrostatic CVTs, Naudic Incremental CVT (iCVT), Cone CVTs, Radial roller CVT, Planetary CVT, or any other version CVT.

5 The foregoing description details certain embodiments. It will be appreciated, however, that no matter how detailed the foregoing appears in text, the preferred embodiments are practiced in many ways. As is also stated above, it should be noted that the use of particular terminology when describing certain features or aspects of the preferred embodiments should not be taken to imply
10 that the terminology is being re-defined herein to be restricted to including any specific characteristics of the features or aspects of the preferred embodiments with which that terminology is associated.

 While preferred embodiments have been shown and described herein, it will be obvious to those skilled in the art that such embodiments are provided
15 by way of example only. Numerous variations, changes, and substitutions will now occur to those skilled in the art without departing from the preferred embodiments. It should be understood that various alternatives to the preferred embodiments described herein could be employed in practicing the preferred embodiments. It is intended that the following claims define the scope of the
20 preferred embodiments and that methods and structures within the scope of these claims and their equivalents be covered thereby.

 Aspects of the invention include:

 Aspect 1. A passive ratio control system for a continuously variable
25 planetary (CVP) having a first traction ring assembly and a second traction ring assembly in contact with a plurality of balls, wherein each ball of the plurality of balls has a tiltable axis of rotation, wherein the tiltable axis of rotation is supported by a first carrier member and a second carrier member, wherein the second carrier member is configured to rotate with respect to the first carrier
30 member corresponding to a change in the tiltable axis of rotation, wherein the passive ratio control system comprises:

 a first spring member operably coupled to the second carrier member;
 and

a second spring member operably coupled to the second carrier member, wherein the first spring member is configured to provide a reaction force in a first direction and the second spring member is configured to provide a reaction force in a second direction, wherein the second direction is opposite of the first direction; and

wherein the first spring member and the second spring member are configured to control the rotational position of the second carrier member with respect to the first carrier member to thereby control a speed ratio of the CVP proportional to an operating torque.

Aspect 2. The passive control system of Aspect 1, wherein the first spring member and the second spring member are torsional springs.

Aspect 3. The passive control system of Aspect 1, further comprising a first damper operably coupled to the first spring member.

Aspect 4. The passive control system of Aspect 3, further comprising a second damper operably coupled to the second spring member.

Aspect 5. The passive control system of any one of Aspects 1 to 4, wherein a positive operating torque corresponds to a change in the CVP speed ratio towards a reduction.

Aspect 6. The passive control system of Aspect 5, wherein a negative operating torque corresponds to a change in the CVP speed ratio towards an overdrive condition.

Aspect 7. The passive control system of any one of Aspects 1 to 6 wherein the second carrier member supports a number of spring elements.

Aspect 8. The passive control system of Aspect 7, wherein the spring elements are coupled to a grounded member.

Aspect 9. The passive control system of Aspect 8, wherein the spring elements are coupled to the first carrier member.

Aspect 10. The passive control system of any of Aspects 1 to 9, wherein the first spring member is integrated into the first carrier member and the second spring member is integrated into the second carrier member.

Aspect 11. A vehicle comprising a CVP and a passive control system of any one of Aspects 1-10.

Aspect 12. The vehicle of Aspect 11 further comprising an electric motor operably coupled to the CVP.

WHAT IS CLAIMED IS:

1. A passive ratio control system for a continuously variable planetary (CVP) having a first traction ring assembly and a second traction ring assembly in contact with a plurality of balls, wherein each ball of the plurality of balls has a tiltable axis of rotation, wherein the tiltable axis of rotation is supported by a first carrier member and a second carrier member, wherein the second carrier member is configured to rotate with respect to the first carrier member corresponding to a change in the tiltable axis of rotation, wherein the passive ratio control system comprises:

a first spring member operably coupled to the second carrier member;
and

a second spring member operably coupled to the second carrier member,

wherein the first spring member is configured to provide a reaction force in a first direction and the second spring member is configured to provide a reaction force in a second direction, wherein the second direction is opposite of the first direction; and

wherein the first spring member and the second spring member are configured to control the rotational position of the second carrier member with respect to the first carrier member to thereby control a speed ratio of the CVP proportional to an operating torque.

2. The passive control system of Claim 1, wherein the first spring member and the second spring member are torsional springs.

3. The passive control system of Claim 1, further comprising a first damper operably coupled to the first spring member.

4. The passive control system of Claim 3, further comprising a second damper operably coupled to the second spring member.

5. The passive control system of any one of Claims 1 to 4, wherein a positive operating torque corresponds to a change in the CVP speed ratio towards a reduction.

5 6. The passive control system of Claim 5, wherein a negative operating torque corresponds to a change in the CVP speed ratio towards an overdrive condition.

7. The passive control system of any one of Claims 1 to 6, wherein
10 the second carrier member supports a number of spring elements.

8. The passive control system of Claim 7, wherein the spring elements are coupled to a grounded member.

15 9. The passive control system of Claim 8, wherein the spring elements are coupled to the first carrier member.

10. The passive control system of any of Claims 1 to 9, wherein the first spring member is integrated into the first carrier member and the second spring member is integrated into the second carrier member.
20

11. A vehicle comprising a CVP and a passive control system of any one of Claims 1-10.

25 12. The vehicle of Claim 11 further comprising an electric motor operably coupled to the CVP.

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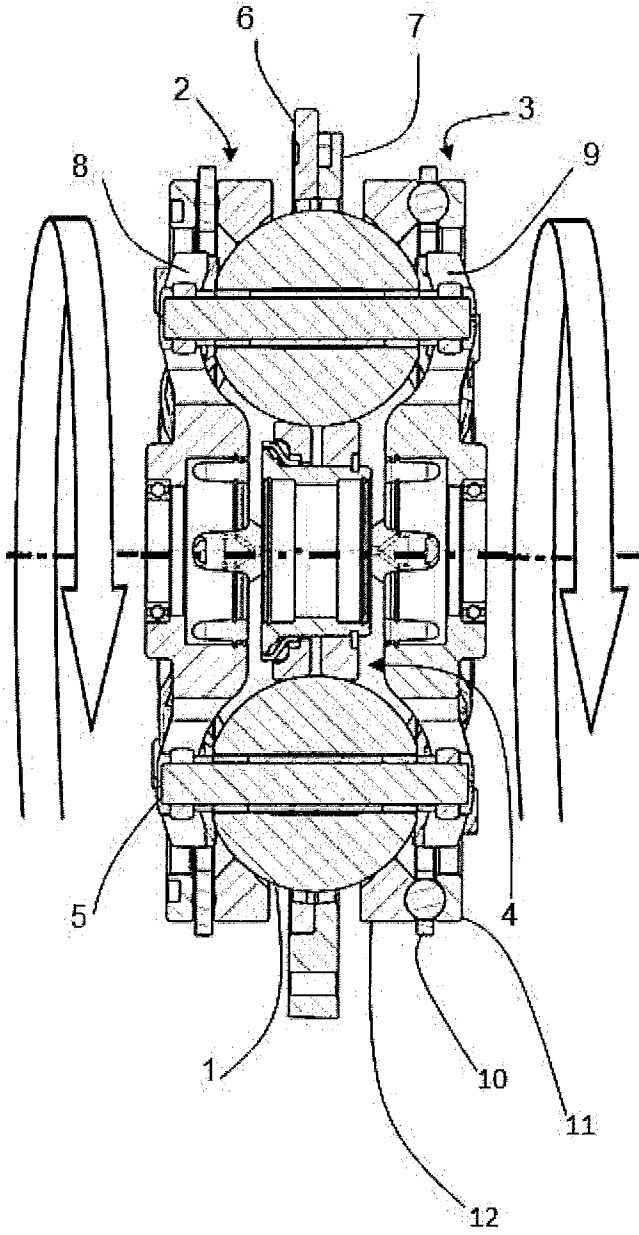


Figure 1

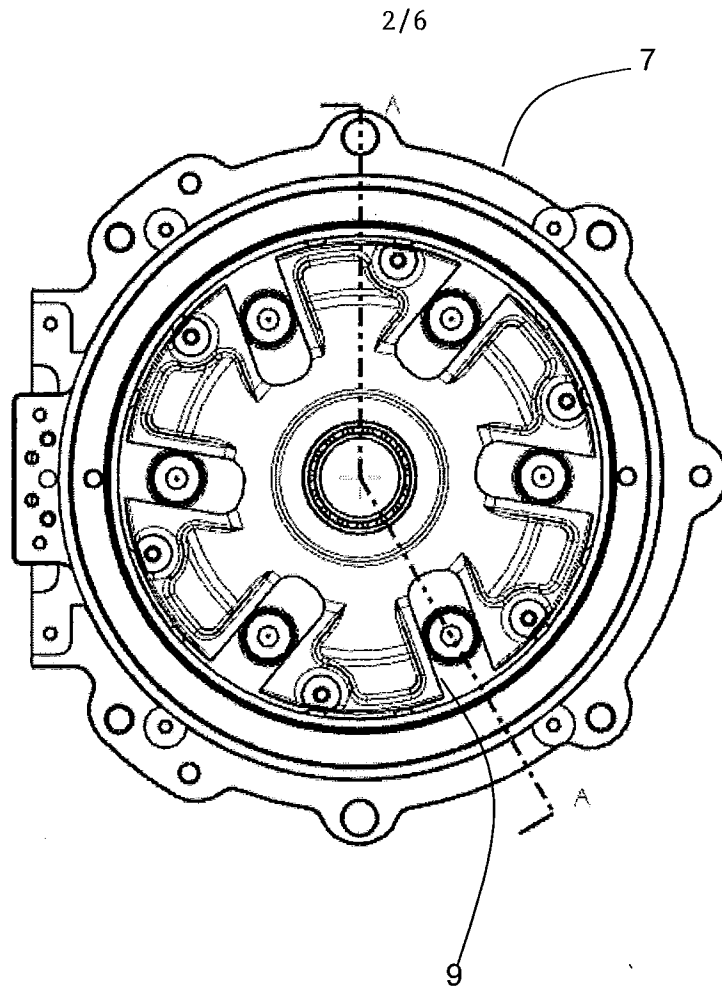


Figure 2

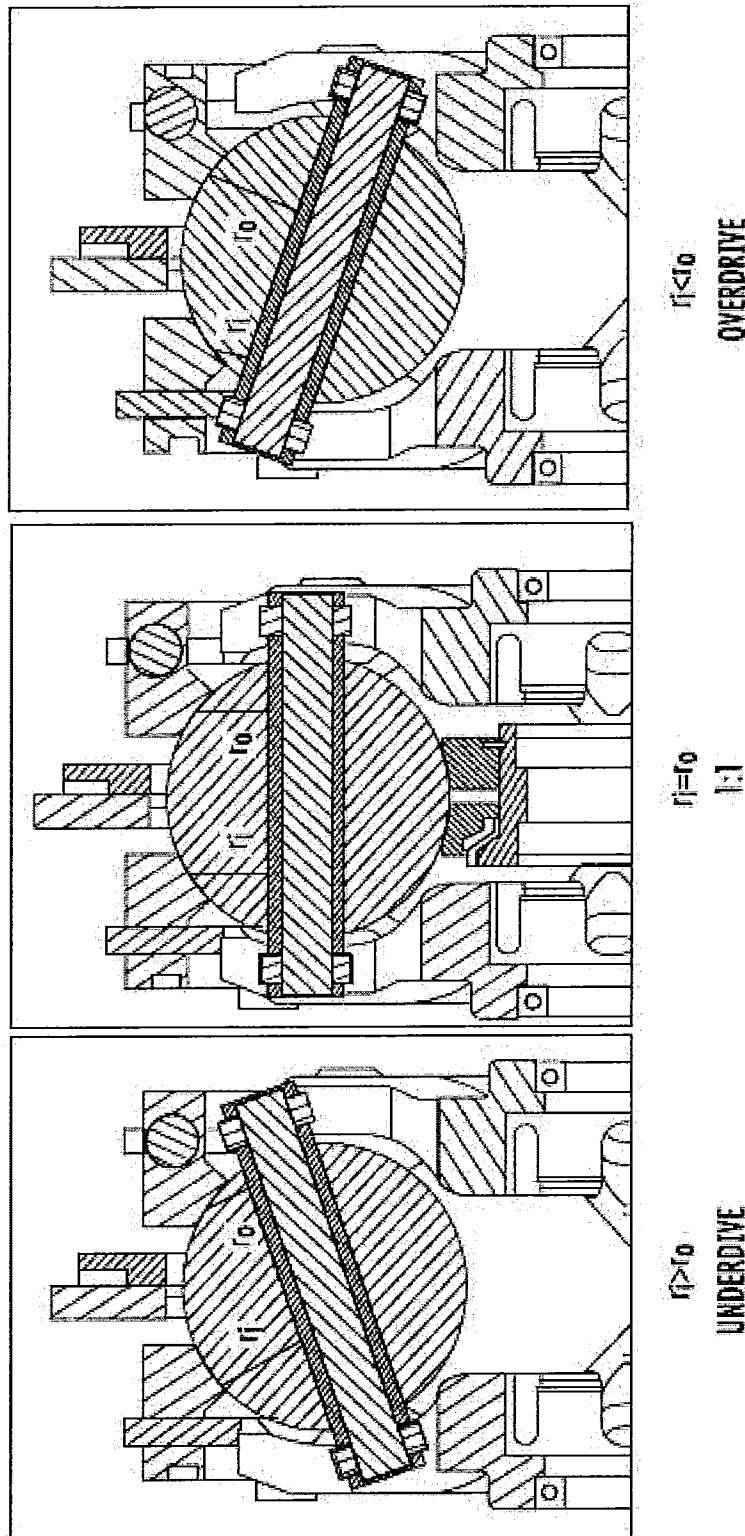


FIG. 3

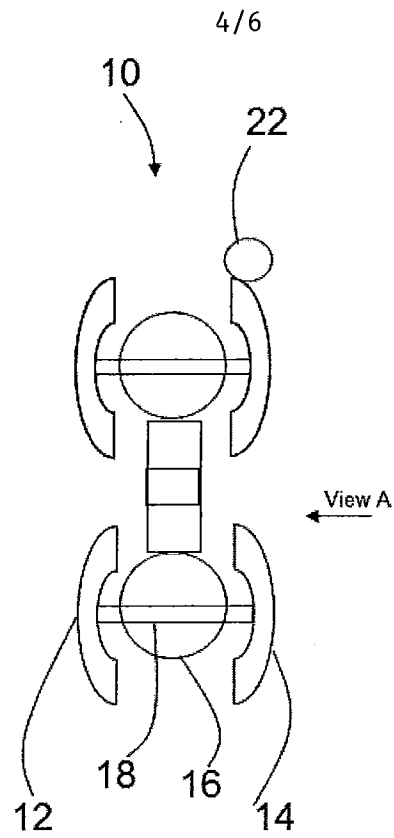


Figure 4

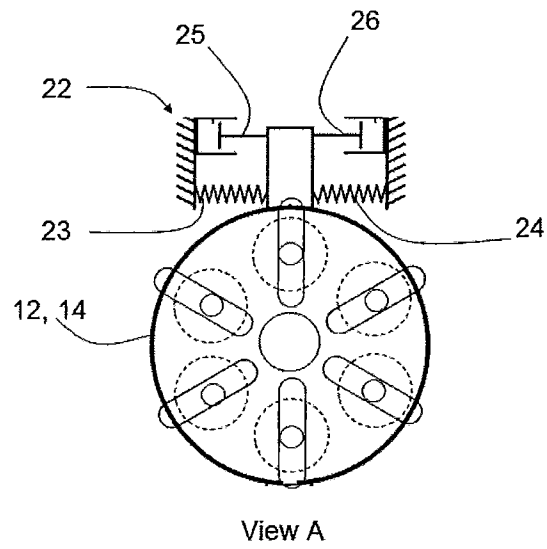


Figure 5

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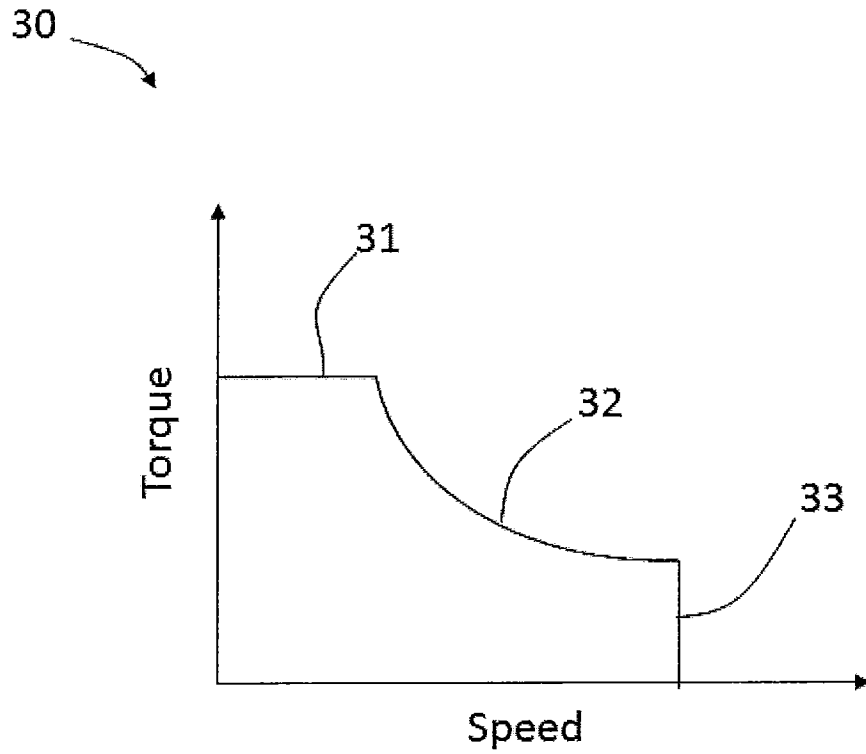


Figure 6

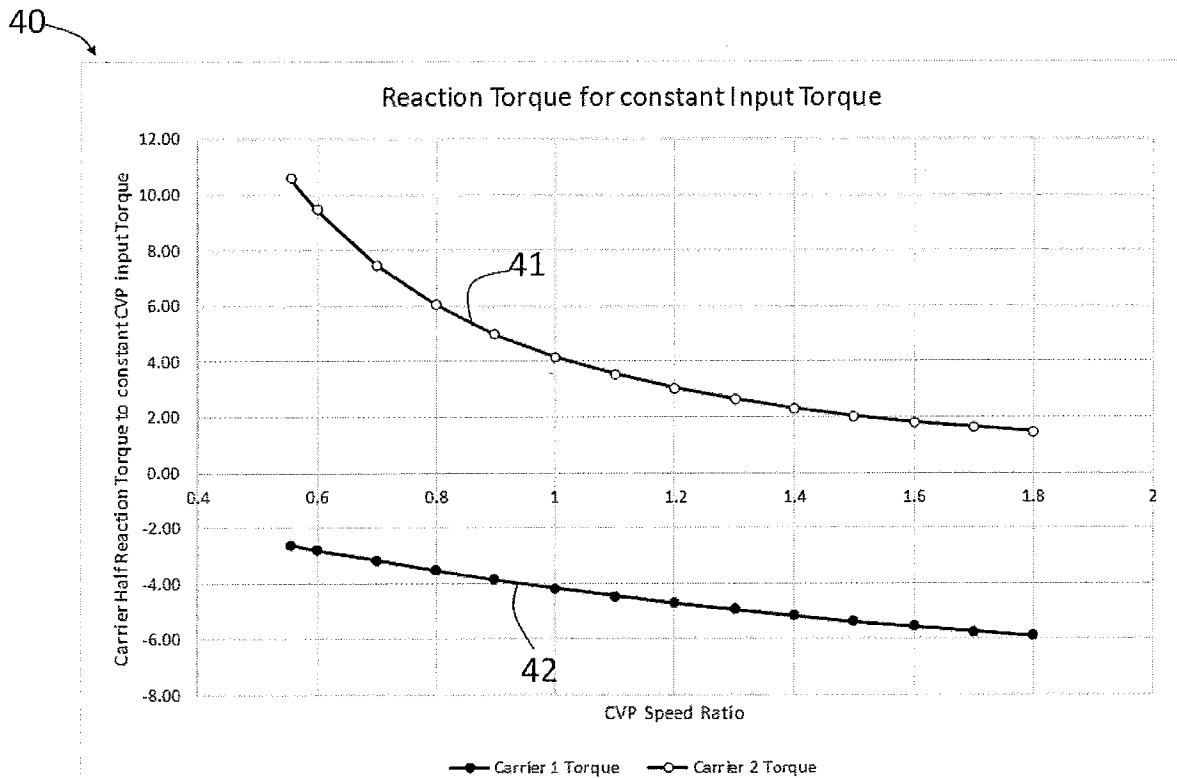


Figure 7

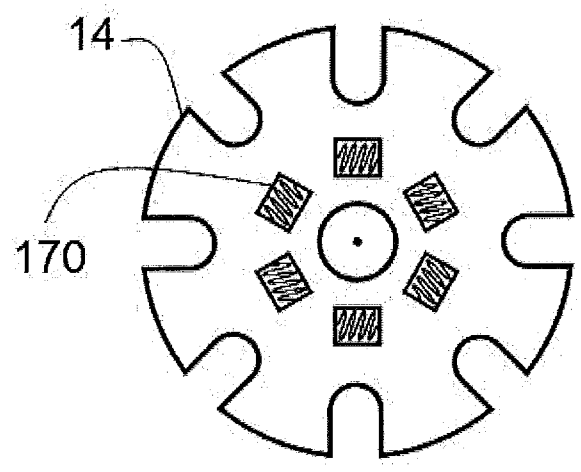


Figure 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/026015

A. CLASSIFICATION OF SUBJECT MATTER INV. F16H61/664 F16H63/06 F16H15/28 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) F16H		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2009/006481 A2 (FALLBROOK TECHNOLOGIES INC [US]; LOHR CHARLES [US]; POHL BRAD P [US];) 8 January 2009 (2009-01-08)	1,11,12
Y	paragraphs [0110], [0179] - [0181]; figures 1A,3,57,58	10
X	----- US 2010/267510 A1 (NICHOLS JON M [US] ET AL) 21 October 2010 (2010-10-21) paragraphs [0113], [0160] - [0161]; figures 38,39,66	1-9,11,12
Y	----- EP 0 040 822 A1 (TORQUE BALL INC [CA]) 2 December 1981 (1981-12-02) page 5, line 21 - page 6, line 7; figure 1	10
A	----- WO 2011/109444 A1 (FALLBROOK TECHNOLOGIES INC [US]; LOHR CHARLES B [US]; SHERRILL JOHN W) 9 September 2011 (2011-09-09) paragraphs [0084] - [0086]; figure 25	1-12
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
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Date of the actual completion of the international search 26 June 2018		Date of mailing of the international search report 06/07/2018
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Martínez Hurtado, L

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