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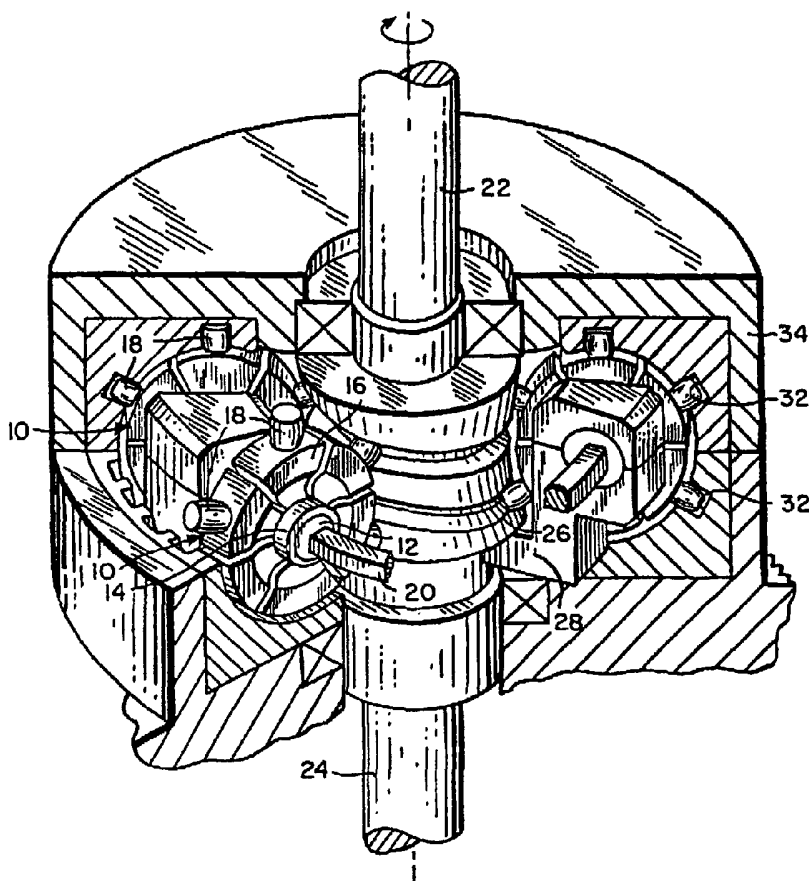
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[Continued on next page]

(54) Title: TOROIDAL TRANSMISSION WITH A CENTRAL WORM GEAR



(57) Abstract: A method is provided for optimally engineering a toroidal transmission having a desired input/output ratio to implement the desired ratio of the transmission while meeting the torque and efficiency requirements of the design. Nanoparticle technology is used to manufacture the stator races (32) to replace the cutting and milling procedures now in use. A novel Mitchell bearing sleeve and its particular hydrodynamic lubrication and cooling method are proposed herein, as well as the introduction of a novel, ultra smooth, amorphous non-oxidizing contact sleeve material used to form the contact sleeve of the drive rollers (18). A novel self-lubricating system is further provided that includes an oil reservoir (102) disposed within an output shaft (100) of the transmission.



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28 October 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

Inter I Application No
PC 1/03 03/35399

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F16H1/30 F16H25/06

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)
IPC 7 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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 297 919 A (KUEHNLE MANFRED R) 3 November 1981 (1981-11-03) the whole document	1
X	US 3 242 755 A (KUEHNLE MANFRED R) 29 March 1966 (1966-03-29) the whole document	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search

25 March 2004

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28.07.04

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/35399

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claim: 1

Method of designing a toroidal transmission including a worm gear, rotors units being in rolling engagement with helical stator races,

2. claims: 2-14

A toroidal transmission including a worm gear, rotors units being in rolling engagement with helical stator races, the surface of which is formed from monodispersed metal nanosize particles.

3. claims: 15,16

A toroidal transmission including a worm gear, rotors units being in rolling engagement with helical stator races, this transmission having an oil reservoir disposed within the output shaft of the transmission.

4. claims: 17-23

An apparatus for transmitting power and/or motion having rotor units being in rolling engagement with grooves, the lead angles of which are chosen to provide maximum running efficiency.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/35399

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4297919	A	03-11-1981	DE 3014860 A1 FR 2454564 A1 NL 8002267 A	30-10-1980 14-11-1980 21-10-1980

US 3242755	A	29-03-1966	BE 675374 A DE 1301682 B GB 1133361 A NL 6601678 A ,B SE 325761 B	16-05-1966 21-08-1969 13-11-1968 12-08-1966 06-07-1970
