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(54) Title: TRANSMISSION SHAFT DEVICE

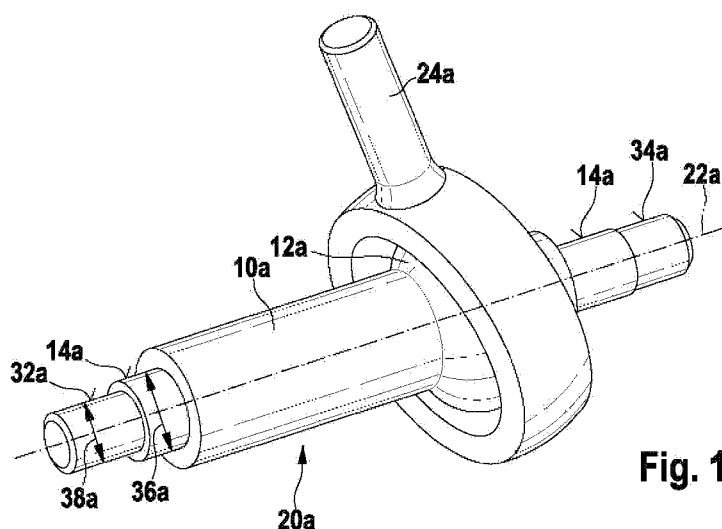


Fig. 1

(57) Abstract: A transmission shaft device for a hand-held power tool, comprising: a transmission shaft (10a-10e) with at least one bearing surface (14a-14e) for mounting a pinion (16c-16e, 18e) and/or at least one integral pinion (16b), and a wobble bearing (12a-12e); wherein the transmission shaft (10a-10e) comprises at least one portion which is permanently coupled with the wobble bearing (12a-2e) in a rotatably fixed manner.

Transmission Shaft Device

Technical Field

The invention relates to an improved transmission shaft devices.

Background Art

Transmission shaft devices for a hand-held power tool, which comprise a transmission shaft and a wobble bearing, are well-known. These transmission shaft devices consist of a plurality of parts.

Summary of the Invention

The invention relates to a transmission shaft device for a hand-held power tool, which comprises a transmission shaft with at least one bearing surface for mounting a pinion and/or at least one integral pinion, and a wobble bearing, wherein the transmission shaft comprises at least one portion which is permanently coupled with the wobble bearing in a rotatably fixed manner. Thereby, additional parts can be done without and/or the transmission shaft can advantageously be produced lightweight at low cost. In this context the term “transmission shaft” shall be understood especially as a shaft that rotates about an axis in at least one operational state, to transmit a torque from an input source, such as an electric motor or a transmission, to an output, e.g. a tool holder or another transmission. In this context the term “pinion” shall be understood especially as an external gearwheel to transmit a torque and/or force to or from the transmission shaft. In this context the term “permanently coupled” shall be understood especially as inseparably attached. In this context “mounted” shall be understood as at least two separated parts being coupled.

Furthermore, the transmission shaft is formed integrally with the wobble bearing, whereby a fast and easy production of the transmission shaft device can be achieved. In this context the term “integrally” shall be understood especially as made in one piece and/or bonded so that the parts cannot be dismantled without causing damage.

In another embodiment of the invention, the transmission shaft device comprises at least one pinion, which is mounted on the transmission shaft in a rotatably fixed manner. Thereby, the transmission shaft device can be driven by a transmission gear.

In another embodiment of the invention the at least one pinion is pressed onto the transmission shaft. Thereby, an easy and quick attachment of the at least one pinion can be achieved.

In addition, the transmission shaft device comprises at least one further pinion, which is

mounted to the transmission shaft in a rotatably fixed manner. Thereby, the transmission shaft can be flexibly integrated into a transmission gear.

Moreover, seen in a longitudinal direction, at least one of the pinions is arranged in front of the wobble bearing and at least one of the pinions is arranged behind the wobble bearing. Thereby, a force can advantageously be easily transmitted from one end to an opposite end by the transmission shaft.

Furthermore, the transmission shaft comprises at least one shaft bearing surface. Thereby, the transmission shaft can be reliably supported in a transmission of a hand-held power tool. In this context the term “shaft bearing surface” shall be understood especially as a surface provided to be in contact with a bearing housing, in order to bear the transmission shaft.

In addition, the at least one shaft bearing surface is arranged adjacent to the at least one bearing surface. Thereby, the transmission shaft can easily be held in a longitudinal direction.

Brief Description of the Drawings

Further objects, features and advantages of the present invention will become apparent from reading the following detailed description when taken in combination with the accompanying drawings wherein particular embodiments of the invention are disclosed as illustrative examples.

Fig. 1 shows a view of a transmission shaft device for a hand-held power tool,

Fig. 2 shows a view of a second embodiment of a transmission shaft device,

Fig. 3 shows a view of a third embodiment of a transmission shaft device,

Fig. 4 shows a view of a fourth embodiment of a transmission shaft device, and

Fig. 5 shows a view of a fifth embodiment of a transmission shaft device.

Detailed Description of Preferred Embodiments

Figure 1 shows a transmission shaft device for a hand-held power tool, which comprises a transmission shaft 10a with two bearing surfaces 14a, and a wobble bearing 12a. The transmission shaft 10a is permanently coupled with the wobble bearing 12a in a rotatably fixed manner. Furthermore, the transmission shaft 10a is inseparably attached to the wobble bearing 12a. The transmission shaft 10a transmits a torque from an input source to an output (not shown). The bearing surfaces 14a are provided to bear a pinion (not shown). In this context, a person skilled in the art would also consider to have the transmission shaft 10a borne by the bearing surface 14a.

The transmission shaft 10a is formed integrally with the wobble bearing 12a. The

transmission shaft 10a and the wobble bearing 12a are made in one part by a casting process. In this context, a person skilled in the art would also consider other processes to join the transmission shaft 10a permanently to the wobble bearing 12a, e.g. welding processes, bonding processes or soldering processes.

With regard to the wobble bearing 12a, the transmission shaft 10a comprises a generally cylindrically shaped portion 20a that is oriented at a flat angle relative to an axis 22a of the transmission shaft 10a. The wobble bearing 12a has an elongated wobble arm 24a that is mounted in ball bearings (not shown) for rotating relative to the cylindrically shaped portion 20a, which permits the wobble arm 24a to move in a left and right direction relative to the cylindrical portion 20a when the transmission shaft 10a is rotated during operation.

More particularly, when the transmission shaft 10a is rotated, an angular orientation of the cylindrical portion 20a changes, and the wobble arm 24a of the wobble bearing 12a is moved in a reciprocating manner.

The transmission shaft comprises two shaft bearing surfaces 32a, 34a. The shaft bearing surfaces 32a, 34a are arranged adjacent to the bearing surfaces 14a. A diameter 36a of the transmission shaft 10a at the bearing surfaces 14a is larger by 50% than a diameter 38a of the transmission shaft 10a at the shaft bearing surfaces 32a, 34a.

Further embodiments of the invention are shown in figures 2 – 5. The following descriptions are limited essentially to the differences between the five embodiments. To distinguish the embodiments the letter a in the reference numerals of the embodiment in figure 1 is replaced by the letters b – e in the reference numerals of the embodiments of figures 2 – 5. As for unmodified components, especially components with the same reference numerals, they can be referred back to the drawing and/or description of the first embodiment.

In another embodiment of the invention, as shown in figure 2, the transmission shaft device comprises a pinion 16b at an end 26b of a transmission shaft 10b, which is mounted on the transmission shaft 10b in a rotatably fixed manner. The pinion 16b is formed integrally with the transmission shaft 10b. Seen from the end 26b in a longitudinal direction 30b, a bearing surface 14b is arranged at an opposite end 28b of the transmission shaft 10b.

In an operational state, a gearwheel (not shown) sets the transmission shaft 10b in rotation. Thereby, a wobble arm 24b of a wobble bearing 12b is moved in a reciprocating manner. The wobble arm 24b drives a tool holder for a hammer or a saw (not shown).

Figures 3 and 4 show further views of a transmission shaft device, wherein, seen in a

longitudinal direction, a pinion 16c, 16d is mounted on a transmission shaft 10c, 10d and arranged in front of a wobble bearing 12c, 12d.

Each pinion 16c, 16d is mounted on the transmission shaft 10c, 10d in a rotatably fixed manner at one end 26c, 28d. Seen from the end 26c, 28d in a longitudinal direction 30c, 30d, a bearing surface 14c, 14d is arranged at an opposite end 28c, 26d of the transmission shaft 10c, 10d.

In an operational state, a gearwheel (not shown) sets the transmission shaft 10c, 10d into rotation. Thereby, a wobble arm 24c, 24d of the wobble bearing 12c, 12d is moved in a reciprocating manner. The wobble arm 24c, 24d drives a tool holder for a hammer or a saw (not shown).

Another embodiment of the transmission shaft device is shown in figure 5. A transmission shaft 10e comprises a first pinion 16e and a second pinion 18e. In an operational state, the transmission shaft transmits a torque in a longitudinal direction 30e, between the first pinion 16e and the second pinion 18e. The first pinion 16e and the second pinion 18e are pressed onto the transmission shaft 10e. Therefore, the first pinion 16e and the second pinion 18e are mounted on the transmission shaft 10e in a rotatably fixed manner.

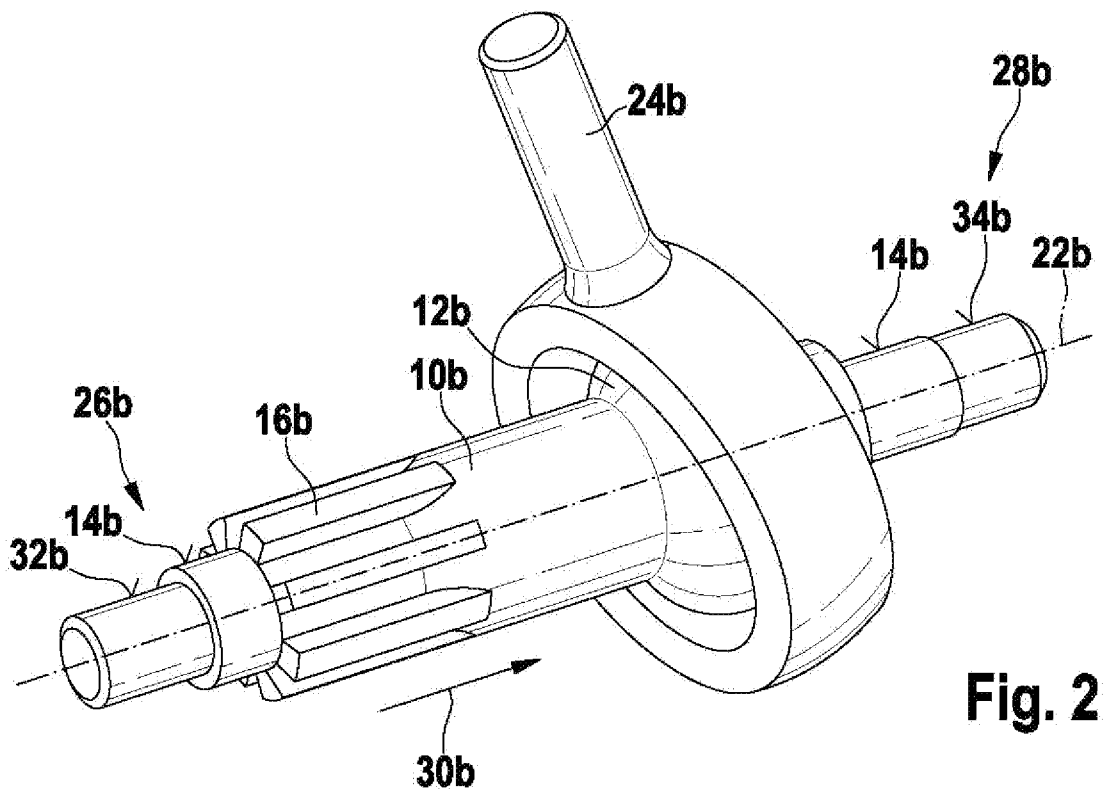
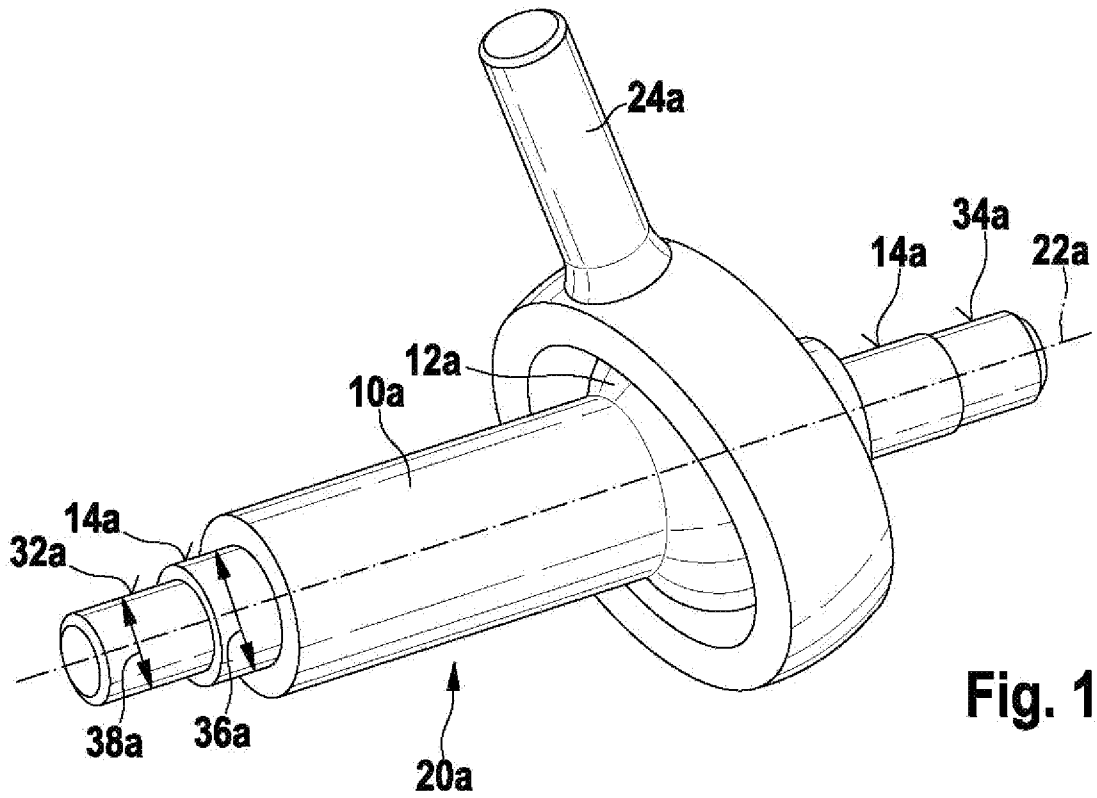
Seen in a longitudinal direction 30e, the first pinion 16e is arranged in front of a wobble bearing 12e. Thereby, in an operational state, a force is transmitted by the transmission shaft 10e from the first pinion 16e to the second pinion 18e. Furthermore, the second pinion 18e is arranged behind the wobble bearing 12e. Thereby, one pinion 16e, 18e is arranged on each side of the wobble bearing 12e.

The present invention may be embodied and/or configured in other ways than specified above. A range of modifications, alternatives, variations, and equivalents to the various structures shown and described will be apparent to one skilled in the art. Accordingly, the present invention is not intended to be limited to the particular embodiments illustrated but is intended to cover all such alternatives, modifications, and equivalents as may be included within the spirit and wide scope of the invention as defined by the following claims. All patents, patent applications, and printed publications referred to herein are hereby incorporated by reference in their entirety.

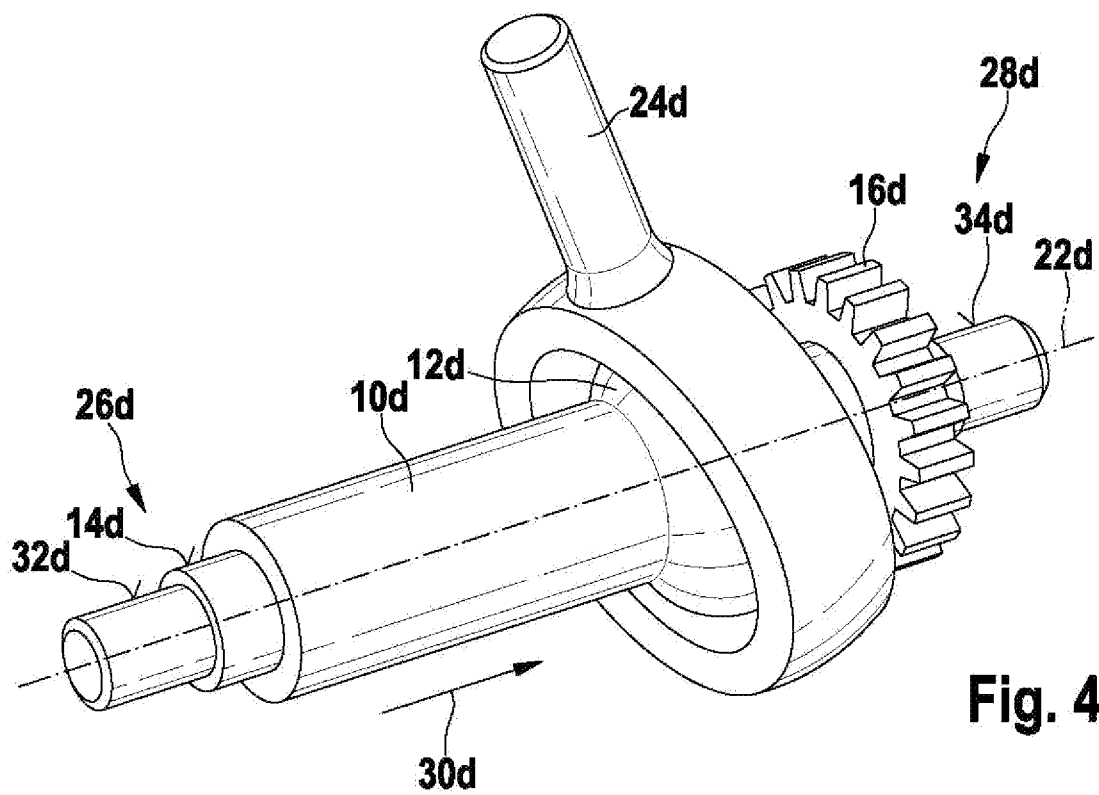
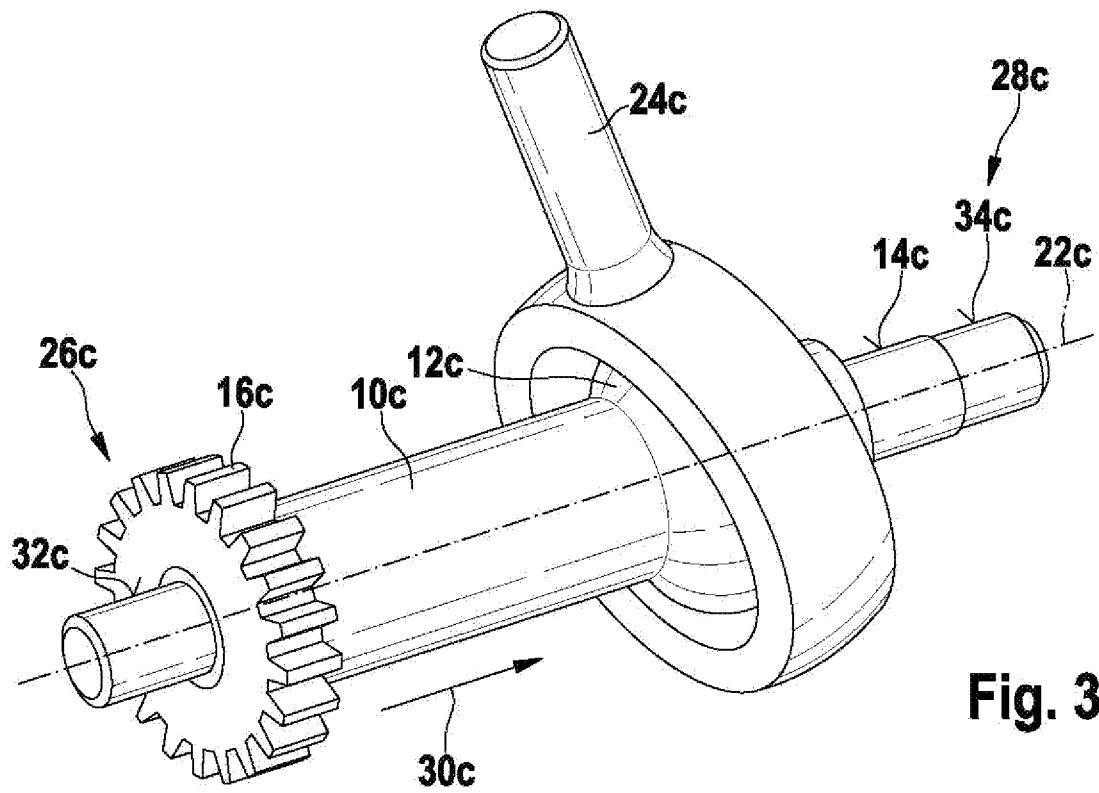
CLAIMS

1. A transmission shaft device for a hand-held power tool, comprising:
a transmission shaft (10a – 10e) with at least one bearing surface (14a – 14e) for mounting a pinion (16c – 16e, 18e) and/or at least one integral pinion (16b), and a wobble bearing (12a – 12e);
wherein the transmission shaft (10a – 10e) comprises at least one portion which is permanently coupled with the wobble bearing (12a – 12e) in a rotatably fixed manner.
2. The transmission shaft device according to claim 1, wherein the transmission shaft (10a – 10e) is formed integrally with the wobble bearing (12a – 12e).
3. The transmission shaft device according to claim 1 or 2, comprising at least one pinion (16b – 16e) which is mounted to the transmission shaft (10b – 10e) in a rotatably fixed manner.
4. The transmission shaft device according to claim 3, wherein the at least one pinion (16c – 16e, 18e) is pressed onto the transmission shaft (10c – 10e).
5. The transmission shaft device according to claim 3 or 4, comprising at least one further pinion (18e) which is mounted on the transmission shaft (10e) in a rotatably fixed manner.
6. The transmission shaft device at least according to claim 5, wherein, seen in a longitudinal direction, at least one of the pinions (16e) is arranged in front of the wobble bearing (12e) and at least one of the pinions (18e) is arranged behind the wobble bearing (12e).
7. The transmission shaft device according to one of the precedent claims, wherein the transmission shaft (10a – 10e) comprises at least one shaft bearing surface (32a – 32e, 34a – 34e).
8. The transmission shaft device according to claim 7, wherein the at least one shaft bearing surface (32a – 32e, 34a – 34e) is arranged adjacent to the at least one bearing surface (14a – 14e).
9. A hand-held power tool comprising a transmission shaft device according to one of the precedent claims.

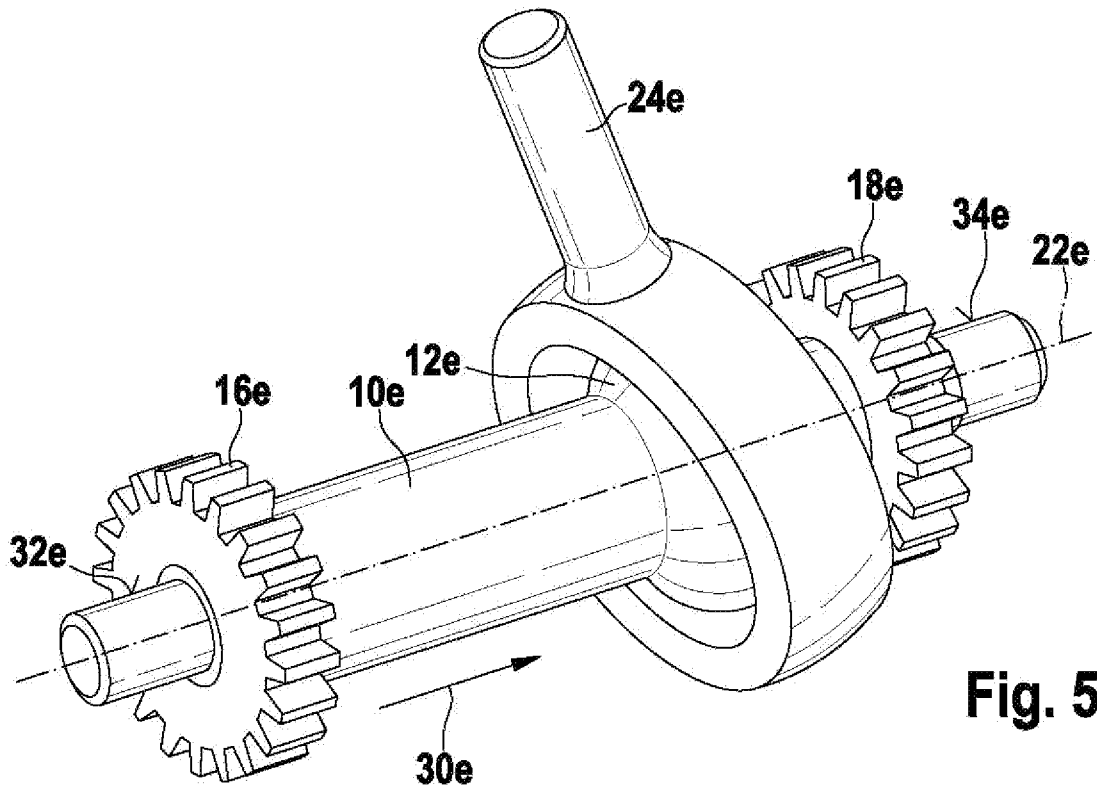
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2011/071302

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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:B25D,F16D,B60K

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)

EPODOC,WPI, CNPAT, CNKI: transmiss+, shaft+, devic+, hand+, tool+, wobbl+, bearing?, pinion+, hammer+, fix+, rotat+, press+, coupl+, spindl+, switch+, driv+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN1532028A (BOSCH GMBH ROBERT) 29 Sep.2004 (29.09.2004) pages 4-7, Figs. 1,3-4	1,9
A	CN101641187A (BOSCH GMBH ROBERT) 03 Feb.2010(03.02.2010) the whole document	1-9
A	EP0847837A2 (BOSCH GMBH ROBERT) 17 Jun.1998(17.06.1998) the whole document	1-9
A	DE102006061600A1 (METABOWERKE GMBH) 03.Jul.2008 (03.07.2008) the whole document	1-9

☐ Further documents are listed in the continuation of Box C.☒ See patent family 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 application or patent but published on or after the international filing date

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“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

“T” 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

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Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2011/071302

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN1532028A	29.09.2004	JP2004284012A	14.10.2004
		US6918450B2	19.07.2005
		DE10312980A1	07.10.2004
CN101641187A	03.02.2010	WO2008107253A1	12.09.2008
		US2010108339A1	06.05.2010
		EP2129495A1	09.12.2009
		DE102007009985A1	25.09.2008
EP0847837A2	17.06.1998	JP10180513A	07.07.1998
		DE19651828A1	18.06.1998
DE102006061600A1	03.07.2008	None	

INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER:

B25D16/00 (2006.01) i

F16D3/26 (2006.01) i