(51) International Patent Classification:
    F16H 1/28 (2006.01)    A47J 43/04 (2006.01)

(21) International Application Number:
    PCT/KR2014/011765

(22) International Filing Date:
    3 December 2014 (03.12.2014)

(25) Filing Language:
    English

(26) Publication Language:
    English

(30) Priority Data:
    10-2014-0138843 15 October 2014 (15.10.2014)    KR


(74) Agent: SON, Min; (Hanoi Intellectual Property & Law) STX R&D Center, 6th Floor, 163, YangJaeCheon-ro, Gangnam-gu, Seoul 135-855 (KR).


(54) Title: GEAR REDUCER, AND JUICER INCLUDING SAME

(57) Abstract: A gear reducer and a juicer including the gear reducer are disclosed. The gear reducer transfers rotational force, provided by a drive unit, to a juice extraction screw assembly after gear reduction. The gear reducer includes one or more gear reduction units. At least one of the one or more gear reduction units includes a sun gear coaxially connected to a rotating shaft of the drive unit; a ring gear configured such that a plurality of gear teeth are formed on the inner circumferential surface thereof around the sun gear, and configured to output a rotation speed slower than the rotation speed of the sun gear; and a plurality of planetary gears disposed between the sun gear and the ring gear, and configured to transfer the rotational force of the sun gear to the ring gear.

[Continued on next page]

Published:

— with international search report (Art. 21(3))
Description

Title of Invention: GEAR REDUCER, AND JUICER INCLUDING SAME

Technical Field

The present invention relates to a gear reducer included in a juicer for grinding and pressing vegetables or fruit to obtain juice, etc., and a juicer including the gear reducer and, more particularly, to a gear reducer capable of considerably reducing the possibility of the partial breakdown of a juice extraction screw assembly while reducing rotation speed at a high ratio, and a juicer including the gear reducer.

Background Art

In order to have healthy lifestyles, cases of people personally making and drinking vegetable juice or other types of juice in homes have been on the rise. In line with this trend, various types of juice extraction apparatuses, such as juicers, that can be conveniently used in homes have been developed.

In general, conventional juicers are operated in such a manner that fruit or vegetables are accommodated in a housing equipped with a juice extraction screw assembly and the fruit or vegetables are ground and pressed by rotating the juice extraction screw assembly via a drive motor, thereby extracting juice.

Although these conventional juicers are advantageous in that grinding can be performed in a short period of time because fruit flesh, etc. can be ground into small pieces by the juice extraction screw assembly driven at a high speed, they exhibit a limitation in usage when a user desires to have fruit flesh, together with juice, depending on the type of fruit.

Recently, a method of extracting juice by squeezing fruit or vegetables while rotating a juice extraction screw assembly at a low speed has been used as a method of extracting juice. This method requires considerably high force in order to reduce the rotation speed of the juice extraction screw assembly and squeeze juice.


Korean Patent Application Publication No. 10-2006-01 17616 discloses a gear reducer that performs gear reduction via one or more combinations of planetary gears.

However, the above-described conventional technologies are problematic in that the number of planetary gears or the number of gear reduction gear trains should be considerably increased in order to achieve a high gear reduction ratio. In addition, when
the number of planetary gears or the number of gear reduction gear trains is increased, another problem arises in that the internal space of a juicer should be increased accordingly.

Disclosure of Invention

Technical Problem

[9] The present invention is intended to provide a gear reducer capable of providing a high gear reduction ratio while occupying a smaller space compared to the conventional art, and a juicer including the gear reducer.

[10] The present invention is also intended to provide a gear reducer capable of reducing the possibility of part breakdown compared to the conventional art, and a juicer including the gear reducer.

Solution to Problem

[11] In order to accomplish the above objects, the present invention provides a gear reducer for a juicer, the gear reducer transferring rotational force, provided by a drive unit, to a juice extraction screw assembly after gear reduction, the gear reducer including one or more gear reduction units; wherein at least one of the one or more gear reduction units includes a sun gear coaxially connected to a rotating shaft of the drive unit; a ring gear configured such that a plurality of gear teeth are formed on the inner circumferential surface thereof around the sun gear, and configured to output a rotation speed slower than the rotation speed of the sun gear; and a plurality of planetary gears disposed between the sun gear and the ring gear, and configured to transfer the rotational force of the sun gear to the ring gear.

[12] The plurality of planetary gears may include a plurality of inner planetary gears directly engaged with the sun gear; and a plurality of outer planetary gears engaged between the plurality of inner planetary gears and the ring gear.

[13] The number of the inner planetary gears and the number of the outer planetary gears may be each 3XL (where L is a natural number).

[14] The number of gear teeth of the sun gear may be 3xMi, the number of gear teeth of the inner planetary gear may be 3xM2, the number of gear teeth of the outer planetary gear may be 3xM3, and the number of gear teeth of the ring gear may be 3xM4 (where Mi, M2, M3, and M4 are natural numbers).

[15] The number of gear teeth of the sun gear may be 12xNi, the number of gear teeth of the inner planetary gear may be 15xN2, the number of gear teeth of the outer planetary gear may be 15xN3, and the number of gear teeth of the ring gear may be 60xN4 (where N1, N2, N3, and N4 are natural numbers).

[16] The gear reducer may include a primary gear reduction unit configured to primarily gear-reduce the rotational force provided by the drive unit, and a secondary gear
reduction unit configured to secondarily gear-reduce the rotational force provided by the drive unit; the primary gear reduction unit may include a first sun gear coaxially connected to the rotating shaft of the drive unit, a first ring gear configured such that a plurality of gear teeth are formed on an inner circumferential surface thereof around the first sun gear, and configured to output a primarily gear-reduced rotation speed slower than a rotation speed of the first sun gear, and a plurality of first planetary gears disposed between the first sun gear and the first ring gear, and configured to transfer the rotational force of the first sun gear to the first ring gear; and the secondary gear reduction unit may include a second sun gear coaxially connected to the rotating shaft of the drive unit, a second ring gear configured such that a plurality of gear teeth are formed on the inner circumferential surface thereof around the second sun gear, and configured to output a secondarily gear-reduced rotation speed slower than the rotation speed of the second sun gear, and a plurality of second planetary gears disposed between the second sun gear and the second ring gear, and configured to transfer the rotational force of the second sun gear to the second ring gear.

The plurality of second planetary gears may be rotatably mounted on the first ring gear rotating with the primarily gear-reduced rotation speed, and a rotating shaft of the juice extraction screw assembly is connected to a shaft connection hole of the second ring gear rotating with the secondarily gear-reduced rotation speed.

The plurality of second planetary gears may include a plurality of inner planetary gears directly engaged with the second sun gear; and a plurality of outer planetary gears engaged between the plurality of inner planetary gears and the second ring gear.

The gear reducer may be separably installed in the juicer so that the juicer can be selectively used in low speed mode based on application of the gear reducer and in high speed mode based on the separation of the gear reducer.

In order to accomplish the above objects, the present invention also provides a juicer including the above-described gear reducer.

**Advantageous Effects of Invention**

According to the present invention, there is provided a gear reducer capable of providing a high gear reduction ratio while occupying a smaller space compared to the conventional art, and a juicer including the gear reducer.

According to the present invention, there is also provided a gear reducer capable of reducing the possibility of part breakdown compared to the conventional art, and a juicer including the gear reducer.

**Brief Description of Drawings**

The above and other objects, features and advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction
with the accompanying drawings, in which:

[24] Fig. 1 is a perspective view of a juicer according to an embodiment of the present invention;

[25] Fig. 2 is an exploded perspective view of a gear reducer provided in the juicer of Fig. 1;

[26] Fig. 3 is a lateral sectional view of a primary gear reduction unit provided in the gear reducer of Fig. 2;

[27] Fig. 4 is a lateral sectional view of a secondary gear reduction unit provided in the gear reducer of Fig. 2; and

[28] Fig. 5 is a plan view of an alternative embodiment of the secondary gear reduction unit.

**Mode for the Invention**

[29] Embodiments of the present invention will be described in detail with reference to the accompanying drawings. The thicknesses of lines, the sizes of components, etc. illustrated in the accompanying drawings may be exaggerated for clarity and convenience of description.

[30] Furthermore, terms that will be used below will be defined based on their functions in the context of the present invention, and the definitions of these terms may vary depending on a user or operator's intention or practice. Accordingly, the definitions of these terms should be determined based on the overall description of the present specification.

[31] Throughout the specification, the term "juice extraction" should be understood as including all the steps of cutting, grinding, pressing and/or extracting a material put into a juicer.

[32] In connection with the present invention, when juice extraction is performed on a material, "juice" and "pulp" are generated. In this case, the term "juice" should be understood as referring to an object that a user desires to obtain and drink through juice extraction that is performed on a material, and the term "pulp" refers to a byproduct, other than juice, that is generated in a juice extraction process, and should be generally understood as referring to a material discharged to the outside.

[33]

[34] 1. Description of structure of juicer including gear reducer

[35] A juicer including a gear reducer according to an embodiment of the present invention is described with reference to Fig. 1.

[36] Referring to Fig. 1, the juicer according to the present embodiment includes a housing 100, a juice extraction screw assembly 200, a gear reducer 300, and a drive unit 400.
The housing 100 includes a lower housing 110 and an upper housing 120. The gear reducer 300 and the drive unit 400 are accommodated inside the lower housing 110, and the juice extraction screw assembly 200 is accommodated inside the upper housing 120.

A pushing member 130 illustrated in Fig. 1 is used to put a juice extraction target object into the upper housing 120. A user can easily put a juice extraction target object into the upper housing 120 using the pushing member 130. After the juice extraction target object has been put into the upper housing 120, the juice extraction target object is ground and pressed by the juice extraction screw assembly 200, and thus is separated into juice and pulp. The juice and the pulp may be discharged from the upper housing 120 through corresponding discharge tubes 170 and 150.

The drive unit 400 provides rotational force that is used to rotate the juice extraction screw assembly 200. In the present embodiment, a motor is used as the drive unit 400.

The drive unit 400 may directly drive the juice extraction screw assembly 200, or may drive the juice extraction screw assembly 200 via the gear reducer 300. For this purpose, the gear reducer 300 is not fixedly installed between the drive unit 400 and the juice extraction screw assembly 200, but may be separably installed therebetween.

When the gear reducer 300 is applied between the drive unit 400 and the juice extraction screw assembly 200, the juice extraction screw assembly 200 is connected to the drive unit 400 via the gear reducer 300, in which case the rotational force of the drive unit 400 is transferred to the juice extraction screw assembly 200 after undergoing gear reduction by the gear reducer 300. Meanwhile, when the gear reducer 300 is separated from the juicer, the juice extraction screw assembly 200 receives the rotational force without the intervention of gear reduction by the drive unit 400.

As described above, the gear reducer 300 is separably installed between the drive unit 400 and the juice extraction screw assembly 200, and thus the juicer may be used in low speed mode based on the application of the gear reducer 300 or in high speed mode based on the separation of the gear reducer 300.

2. Description of structure and operation of gear reducer

The structure and operation of the gear reducer 300 are described with reference to Figs. 2, 3, and 4.

The gear reducer 300 according to an embodiment of the present invention includes a primary gear reduction unit 310 and a secondary gear reduction unit 320. These gear reduction units 310 and 320 are accommodated in a casing 380, and thus are not exposed to the outside.

In this case, the primary gear reduction unit 310 performs primary gear reduction on the rotational force provided by the drive unit 400, and the secondary gear reduction
unit 320 performs secondary gear reduction on the rotational force provided by the
drive unit 400. The rotational force provided by the drive unit 400 via the primary and
secondary gear reduction units 310 and 320 undergoes two-stage gear reduction, and
thus a high gear reduction ratio can be achieved.

The gear reducer 300 according to the present embodiment may provide a gear
reduction ratio of 1/85. According to the conventional technology, three or more-stage
gear reduction is required to provide this level of gear reduction ratio. In contrast, the
present embodiment can provide a high gear reduction ratio using only two-stage gear
reduction, and thus the volume of a gear reducer required to provide the same gear
reduction ratio can be reduced compared to conventional one.

The primary gear reduction unit 310 includes a first sun gear 311, a first ring gear
316, a plurality of first planetary gears 312, and a gear box 318.

The first sun gear 311 is disposed at the center of the gear box 318, and is coaxially
connected with the rotating shaft (not illustrated) of the drive unit 400. Accordingly,
the first sun gear 311 rotates at the same rotation speed as the rotating shaft of the drive
unit 400.

A plurality of gear teeth are formed on the inner circumferential surface of the first
ring gear 316 around the first sun gear 311. As clearly illustrated in Fig. 3, the first ring
gear 316 has the number of gear teeth considerably larger than the number of teeth of
the first sun gear 311.

The plurality of first planetary gears 312 is disposed between the first sun gear 311
and the first ring gear 316, and transfers the rotational force of the first sun gear 311 to
the first ring gear 316. Each of the first planetary gears 312 is engaged with the first
sun gear 311 and the first ring gear 316. In the case of the present embodiment, three
planetary gears 312 having the same shape are provided in the primary gear reduction
unit 310.

As illustrated in Fig. 3, when the first sun gear 311 is rotated in a first direction (a
clockwise direction in the drawing) by the drive unit 400, the first ring gear 316
connected to the first sun gear 311 via the first planetary gears 312 is rotated in a
second direction opposite the first direction (a counterclockwise in the drawing).

Meanwhile, since the first ring gear 316 has the number of gear teeth considerably
larger than the number of teeth of the first sun gear 311, the first ring gear 316 rotates
at a rotation speed slower than the rotation speed of the first sun gear 311. According
to this principle, primary gear reduction is achieved by the primary gear reduction unit
310, and thus the first ring gear 316 outputs a primarily gear-reduced rotation speed
slower than the rotation speed of the drive unit 400.

The secondary gear reduction unit 320 is disposed above the above-described
primary gear reduction unit 310, and includes a second sun gear 321, a second ring
The second sun gear 321 is disposed at the center of the top surface 316a of the above-described first ring gear 316, and is coaxially connected to the rotating shaft (not illustrated) of the drive unit 400.

A plurality of gear teeth are formed on the inner circumferential surface of the second ring gear 326 around the second sun gear 311. As clearly illustrated in Fig. 4, the second ring gear 326 has the number of gear teeth considerably larger than the number of gear teeth of the second sun gear 321 (five times in the present embodiment). As illustrated in Fig. 2, a shaft connection hole 328 into which the rotating shaft 220 of the juice extraction screw assembly 200 is inserted is formed through the top surface 327 of the second ring gear 326. In this case, it can be appreciated that the juice extraction screw assembly 200 rotates at the same speed as the second ring gear 326.

The plurality of second planetary gears 322 and 323 is used to transfer the rotational force of the second sun gear 321 to the second ring gear 326. The plurality of second planetary gears 322 and 323 is rotatably disposed on the above-described top surface 316a of the first ring gear 316, and is disposed between the second sun gear 321 and the second ring gear 326.

As illustrated in Fig. 4, when the second sun gear 321 is rotated in a first direction (a clockwise direction in the drawing) by the drive unit 400, the second ring gear 326 connected to the second sun gear 321 via the second planetary gears 322 and 323 is also rotated in the first direction (in the clockwise direction in the drawing).

Meanwhile, since the second ring gear 326 has the number of gear teeth considerably larger than the number of gear teeth of the second sun gear 321, the second ring gear 326 is rotated at a rotation speed slower than the rotation speed of the second sun gear 321. According to this principle, secondary gear reduction is achieved by the secondary gear reduction unit 320.

In this case, since the second planetary gears 322 and 323 are mounted on the first ring gear 316 rotating with the primarily gear-reduced rotation speed as described above, the rotation speed of the second ring gear 326 that are driven by the second planetary gears 322 and 323 is influenced by both the primary gear reduction and the secondary gear reduction. More specifically, since the second planetary gears 322 and 323 are mounted on the first ring gear 316 rotating in the counterclockwise direction, the second planetary gears 322 and 323 revolves around the sun gear 321 in a rotation direction (a counterclockwise direction) opposite the rotation direction (clockwise direction) of the second sun gear 321. The output speed of the second ring gear 326 is influenced by both the above-described primary gear reduction and secondary gear reduction because of the influence of the revolution of the planetary gears 322 and 323.

Accordingly, the juice extraction screw assembly 200 rotatably connected to the
The present embodiment includes a second gear reduction unit 320. The second gear reduction unit 320 is composed of a gear reducer 300 in low-speed mode. The gear reducer 300 receives rotational force in two stages via the gear reducer 300. As described above, the gear reducer 300 of the present embodiment has the primary gear reduction unit 310 and the second gear reduction unit 320, and thus can provide a high gear reduction ratio. Since the high gear reduction ratio is achieved by the gear reducer 300 including only two gear reduction units 310 and 320, the volume of a gear reducer for the same gear reduction ratio can be relatively reduced.

Fig. 5 is a plan view illustrating an alternative embodiment of the secondary gear reduction unit.

Like the above-described secondary gear reduction unit 320, the alternative secondary gear reduction unit 320' illustrated in Fig. 5 also includes a second sun gear 321', a second ring gear 326', and a plurality of second planetary gears 322' and 323'. In this case, the plurality of second planetary gears 322' and 323' includes a plurality of inner planetary gears 323' directly engaged with the second sun gear 321' and a plurality of outer planetary gears 322' engaged between the inner planetary gears 323' and the second ring gear 326'.

The gears 321', 322', 323' and 326' of the secondary gear reduction unit 320' have a connection structure corresponding to the connection structure of the gears 321, 322, 323 and 326 of the above-described secondary gear reduction unit 320. More specifically, the second sun gear 321' is coaxially connected to the rotating shaft of the drive unit 400 (see Fig. 1), the plurality of second planetary gears 322' and 323' are rotatably mounted on the top surface 316a of the first ring gear 316, and the rotating shaft 220 of the screw assembly 200 is connected to the center of the second ring gear 326'.

Accordingly, the operation method of the secondary gear reduction unit 320' also corresponds to the above-described operation method of the secondary gear reduction unit 320.

The secondary gear reduction unit 320' of Fig. 5 is different from the secondary gear reduction unit 320 of Fig. 4 only in that the secondary gear reduction unit 320' of Fig. 5 includes the two inner planetary gears 323' and the two outer planetary gears 322' while the secondary gear reduction unit 320 of Fig. 4 includes the three inner planetary gears 323 and the three outer planetary gears 322. As described above, according to the present invention, the secondary gear reduction unit may include the number of inner planetary gears equal to a multiple of 2 and the number of outer planetary gears equal to a multiple of 2.
3. Description of part breakdown prevention structure of gear reducer

The part breakdown prevention structure of the above-described gear reducer 300 is described below.

In order to achieve effective gear reduction via the above-described primary gear reduction unit 310 and secondary gear reduction unit 320, to reduce the possibility of part breakdown attributable to interaction between gears, and to prevent gear engagement from being released, the following conditions may be applied:

1) Condition 1:

First, as illustrated in Fig. 4, the plurality of second planetary gears 322 and 323 provided in the secondary gear reduction unit 320 are configured to include the plurality of inner planetary gears 323 directly engaged with the second sun gear 321 and the plurality of outer planetary gears 322 engaged between the plurality of inner planetary gears 323 and the second ring gear 326.

The structure of the secondary gear reduction unit 320 contrasts with the structure of the primary gear reduction unit 310 in which the plurality of first planetary gears 312 are all engaged with the first sun gear 311. That is, as clearly illustrated in Figs. 3 and 4, in the present embodiment, the condition 1 is reflected into the secondary gear reduction unit 320, but is not reflected into the primary gear reduction unit 310.

However, in an alternative embodiment, the condition 1 may be applied to the primary gear reduction unit 310 in the same manner, in which case the plurality of first planetary gears 312 of the primary gear reduction unit 310 is configured to include a plurality of inner planetary gears directly engaged with the first sun gear 311 and a plurality of outer planetary gears engaged between the inner planetary gears and the first ring gear 316. Furthermore, on the contrary to the present embodiment, an embodiment in which the condition 1 is not reflected into the secondary gear reduction unit 320 and the condition 1 is reflected only into the primary gear reduction unit 310 may be possible.

When the condition 1 is applied, the advantage of a reduction in the possibility of the part breakdown of the gear reduction units 310 and 320 provided in the gear reducer 300 can be achieved.

2) Condition 2:

Second, as illustrated in Fig. 4, the number of inner planetary gears 323 and the number of outer planetary gears 322 are each configured to be a multiple of 3, and the number of gear teeth second of sun gear 321, the number of gear teeth of inner planetary gears 323, the number of gear teeth of outer planetary gears 322 and the number of gear teeth of second ring gear 326 are each configured to be a multiple of 3.

In other words, the number of inner planetary gears 323 and the number of outer planetary gears 322 are each configured to be 3xL (where L is a natural number), the
number of gear teeth of the second sun gear 321 is configured to be $3xM_1$, the number of gear teeth of inner planetary gears 323 is configured to be $3xM_2$, the number of gear teeth of outer planetary gears 322 is configured to be $3xM_3$, and the number of gear teeth of the second ring gear 326 is configured to be $3xM_4$ (where $M_1$, $M_2$, $M_3$ and $M_4$ are natural numbers).

It can be readily seen from Fig. 4 that the condition 2 has been reflected into the secondary gear reduction unit 320. As can be seen from the drawing, the number of inner planetary gears 323 and the number of outer planetary gears 322 are each three, and the number of gear teeth of the second sun gear 321, the number of gear teeth of the inner planetary gears 323, the number of gear teeth of the outer planetary gears 322 and the number of gear teeth of the second ring gear 326 are 12, 15, 15 and 60, respectively.

It will be apparent that the number of gear teeth of the second sun gear 321, the number of gear teeth of the inner planetary gears 323, the number of gear teeth of the outer planetary gears 322, and the number of gear teeth of the second ring gear 326 may be a multiple of 12, a multiple of 15, a multiple of 15, and a multiple of 60, respectively. That is, the number of gear teeth of the second sun gear 321 may be $15xN_i$, the number of gear teeth of the inner planetary gear 323 may be $15xN_2$, the number of gear teeth of the outer planetary gear 322 may be $15xN_3$, and the number of gear teeth of the second ring gear 326 may be $60xN_4$ (where $N_i$, $N_2$, $N_3$ and $N_4$ are natural numbers).

The possibility of the part breakdown of the secondary gear reduction unit 320 can be reduced by applying the above-described condition 1, and also the release of gear engagement that may occur due to the application of the condition 1 can be prevented by applying the condition 2.

Although the present invention has been described with reference to the embodiments illustrated in the accompanying drawings above so that those skilled in the art can easily understand and practice the present invention, these embodiments are merely illustrative. Accordingly, it will be apparent to those skilled in the art that various modifications and other equivalent embodiments can be made based on the above detailed description of the embodiments. Therefore, the range of protection of the present invention should be defined based on the following claims.
Claims

[Claim 1] A gear reducer for a juicer, the gear reducer transferring rotational force, provided by a drive unit, to a juice extraction screw assembly after gear reduction, the gear reducer comprising:
one or more gear reduction units;
wherein at least one of the one or more gear reduction units comprises:
a sun gear coaxially connected to a rotating shaft of the drive unit;
a ring gear configured such that a plurality of gear teeth are formed on an inner circumferential surface thereof around the sun gear, and configured to output a rotation speed slower than a rotation speed of the sun gear; and
a plurality of planetary gears disposed between the sun gear and the ring gear, and configured to transfer the rotational force of the sun gear to the ring gear.

[Claim 2] The gear reducer of claim 1, wherein the plurality of planetary gears comprises:
a plurality of inner planetary gears directly engaged with the sun gear; and
a plurality of outer planetary gears engaged between the plurality of inner planetary gears and the ring gear.

[Claim 3] The gear reducer of claim 2, wherein the number of the inner planetary gears and the number of the outer planetary gears are each 3xL (where L is a natural number).

[Claim 4] The gear reducer of claim 3, wherein the number of gear teeth of the sun gear is 3xMi, the number of gear teeth of the inner planetary gear is 3xM₂, the number of gear teeth of the outer planetary gear is 3xM₃, and the number of gear teeth of the ring gear is 3xM₄ (where M₁, M₂, M₃, and M₄ are natural numbers).

[Claim 5] The gear reducer of claim 4, wherein the number of gear teeth of the sun gear is 12xNi, the number of gear teeth of the inner planetary gear is 15xN₂, the number of gear teeth of the outer planetary gear is 15xN₃, and the number of gear teeth of the ring gear is 60xN₄ (where N₁, N₂, N₃, and N₄ are natural numbers).

[Claim 6] The gear reducer of claim 1, wherein:
the gear reducer comprises:
a primary gear reduction unit configured to primarily gear-reduce the rotational force provided by the drive unit; and
a secondary gear reduction unit configured to secondarily gear-reduce the rotational force provided by the drive unit;
the primary gear reduction unit comprises:
a first sun gear coaxially connected to the rotating shaft of the drive unit;
a first ring gear configured such that a plurality of gear teeth are formed on an inner circumferential surface thereof around the first sun gear, and configured to output a primarily gear-reduced rotation speed slower than a rotation speed of the first sun gear; and
a plurality of first planetary gears disposed between the first sun gear and the first ring gear, and configured to transfer rotational force of the first sun gear to the first ring gear; and
the secondary gear reduction unit comprises:
a second sun gear coaxially connected to the rotating shaft of the drive unit;
a second ring gear configured such that a plurality of gear teeth are formed on an inner circumferential surface thereof around the second sun gear, and configured to output a secondarily gear-reduced rotation speed slower than a rotation speed of the second sun gear; and
a plurality of second planetary gears disposed between the second sun gear and the second ring gear, and configured to transfer rotational force of the second sun gear to the second ring gear.

[Claim 7] The gear reducer of claim 6, wherein the plurality of second planetary gears is rotatably mounted on the first ring gear rotating with the primarily gear-reduced rotation speed, and a rotating shaft of the juice extraction screw assembly is connected to a shaft connection hole of the second ring gear rotating with the secondarily gear-reduced rotation speed.

[Claim 8] The gear reducer of claim 6, wherein the plurality of second planetary gears comprises:
a plurality of inner planetary gears directly engaged with the second sun gear; and
a plurality of outer planetary gears engaged between the plurality of inner planetary gears and the second ring gear.

[Claim 9] The gear reducer of claim 8, wherein the number of the inner planetary gears and the number of the outer planetary gears are each 3×L (where L is a natural number).

[Claim 10] The gear reducer of claim 9, wherein the number of gear teeth of the
second sun gear is $3xM'$, the number of gear teeth of the inner planetary gears is $3xM_2$, the number of gear teeth of the outer planetary gears is $3xM_3$, and the number of gear teeth of the second ring gear is $3xM_4$ (where $M_i$, $M_2$, $M_3$ and $M_4$ are natural numbers).

[Claim 11] The gear reducer of claim 10, wherein the number of gear teeth of the second sun gear is $15xN_i$, the number of gear teeth of the inner planetary gear is $15xN_2$, the number of gear teeth of the outer planetary gear is $15xN_3$, and the number of gear teeth of the second ring gear is $60xN_4$ (where $N_i$, $N_2$, $N_3$, and $N_4$ are natural numbers).

[Claim 12] The gear reducer of claim 1, wherein the gear reducer is separably installed in the juicer so that the juicer can be selectively used in a low speed mode based on the application of the gear reducer and in a high speed mode based on the separation of the gear reducer.

[Claim 13] A juicer comprising the gear reducer set forth in any one of claims 1 to 12.
[Fig. 1]
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

F16H 1/28(2006.01)i, F16H 1/32(2006.01)i, A47J 43/04(2006.01)i

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 1/28; A47J 19/06; A47J 43/04; A47J 43/07; A47J 43/046; F16H 1/32

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & keywords: gear reducer, sun gear, ring gear, planetary gear, juicer and rotation

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>KR 10-2007-0066720 A (NUC ELECTRONICS CO., LTD.) 27 June 2007</td>
<td>1,12,13</td>
</tr>
<tr>
<td></td>
<td>See abstract, paragraphs [0022]-[0034] and figures 1-7.</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>KR 10-2010-0124372 A (MOSPEC CO., LTD.) 29 November 2010</td>
<td>2-5,8-11</td>
</tr>
<tr>
<td></td>
<td>See abstract, paragraphs [0026]-[0043] and figures 2-4.</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>KR 10-1304086 B1 (SHIN, JONG KY) 05 September 2013</td>
<td>6-11</td>
</tr>
<tr>
<td></td>
<td>See abstract, paragraphs [0027]-[0050] and figures 3-8.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>See abstract, and figures 4-8.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>See abstract, paragraphs [0035]-[0045] and figures 1-5.</td>
<td></td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

See patent family annex.

*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

*K* document member of the same patent family

Date of the actual completion of the international search

20 March 2015 (20.03.2015)

Date of mailing of the international search report

20 March 2015 (20.03.2015)

Name and mailing address of the ISA/KR

International Application Division
Korean Intellectual Property Office
189 Cheongna-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea

Facsimile No. +82 42 472 7140

Authorized officer

PARK, Tae Wook

Telephone No. +82-42-481-3405

Form PCT/ISA/210 (second sheet) (January 2015)
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td>KR 10-2010-0124372 A</td>
<td>29/11/2010</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>WO 2014-046436 A3</td>
<td>27/03/2014</td>
</tr>
<tr>
<td>KR 10-2011-0138107 A</td>
<td>26/12/2011</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>