# (12) UK Patent Application (19) GB (11) 2 453 546 (13) A

(43) Date of A Publication

15.04.2009

(21) Application No:

0719636.3

(22) Date of Filing: 08.10.2007

(71) Applicant(s): **Kenwood Limited** (Incorporated in the United Kingdom) New Lane, Havant, Hants, PO9 2NH, United Kingdom

(72) Inventor(s): **David Lowes** 

(74) Agent and/or Address for Service: **QED Intellectual Property Limited** Harrow Exchange, 2 Gayton Road, HARROW, Middlesex, HA1 2XU, **United Kingdom** 

(51) INT CL:

A47J 43/08 (2006.01) A47J 43/06 (2006.01) A47J 44/00 (2006.01) B01F 7/30 (2006.01) **B01F 15/00** (2006.01)

(56) Documents Cited:

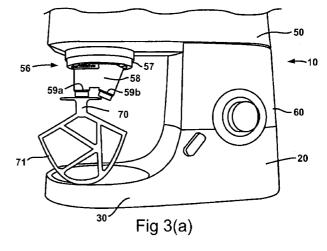
GB 0370851 A US 4697929 A WO 2007/023122 A1

(58) Field of Search: INT CL A47J, B01F

Other: Online: EPODOC, WPI

#### (54) Abstract Title: Planetary drive system

(57) A multi-speed planetary drive system 56, in which a driving head unit can be rotated about a first axis 58 by way of a primary drive shaft wherein the head unit supports first and second drive outlets 59a, 59b. each capable of receiving and driving in rotation, relative to the head unit, a respective tool shaft. The first and second drive outlets are driven by the system at different speeds and about respective axes inclined to one another. Accordingly, different tools can be driven at different speeds and the angles at which the respective tools are presented to a working bowl can differ to be optimised for their respective tasks. The drive system may be installed on a kitchen stand mixer and the slower-driven tool shaft is disposed substantially parallel to the aforementioned first axis. By this means, a tool such as a dough hook can be operated at a relatively low speed and in an optimal orientation. It is further preferred that the faster-driven tool shaft is inclined to the first axis at an angle of between 5 and 30 degrees so that a tool such as a whisk can be operated at relatively high speed and presented at an angle designed to optimise the entrapment of air into the substance being whisked.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

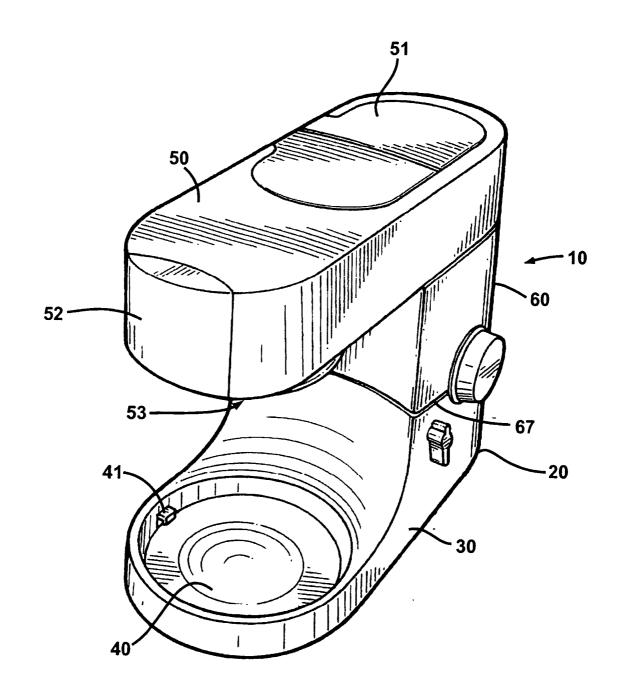


Fig 1

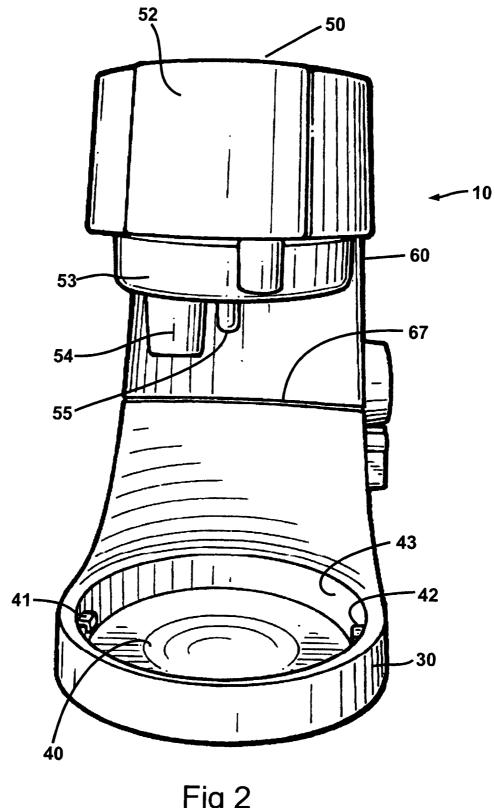
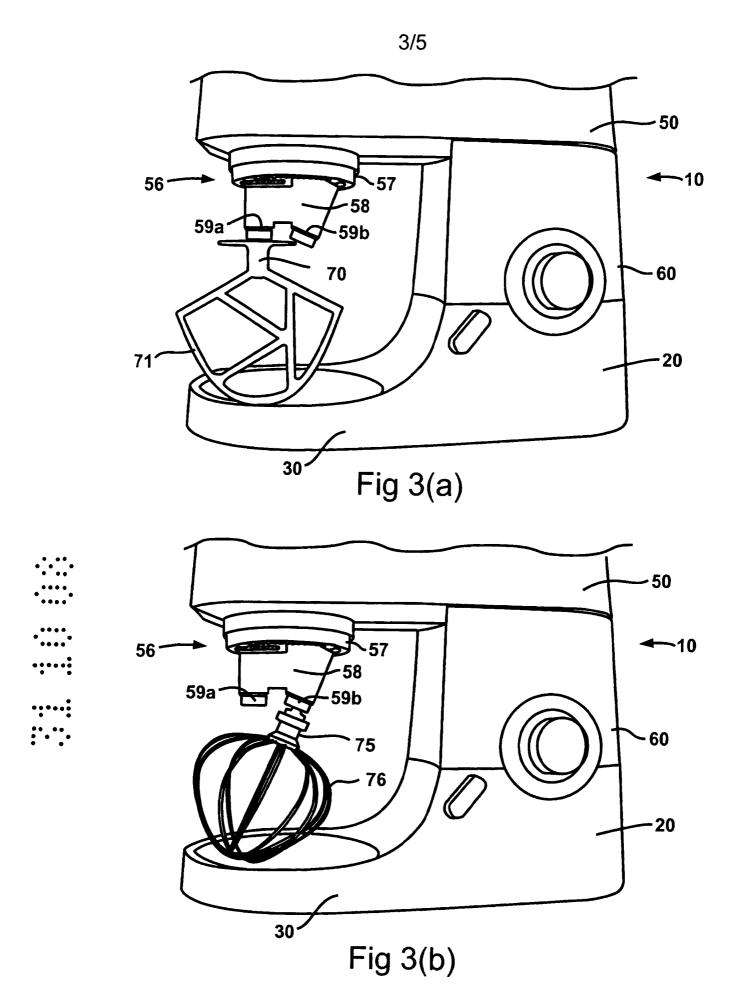


Fig 2



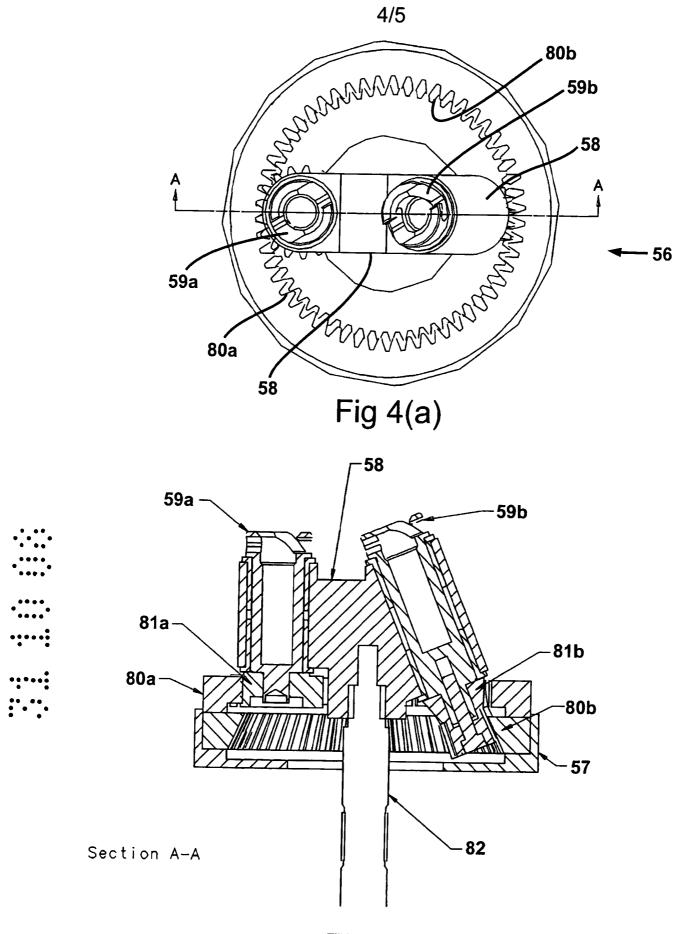


Fig 4(b)

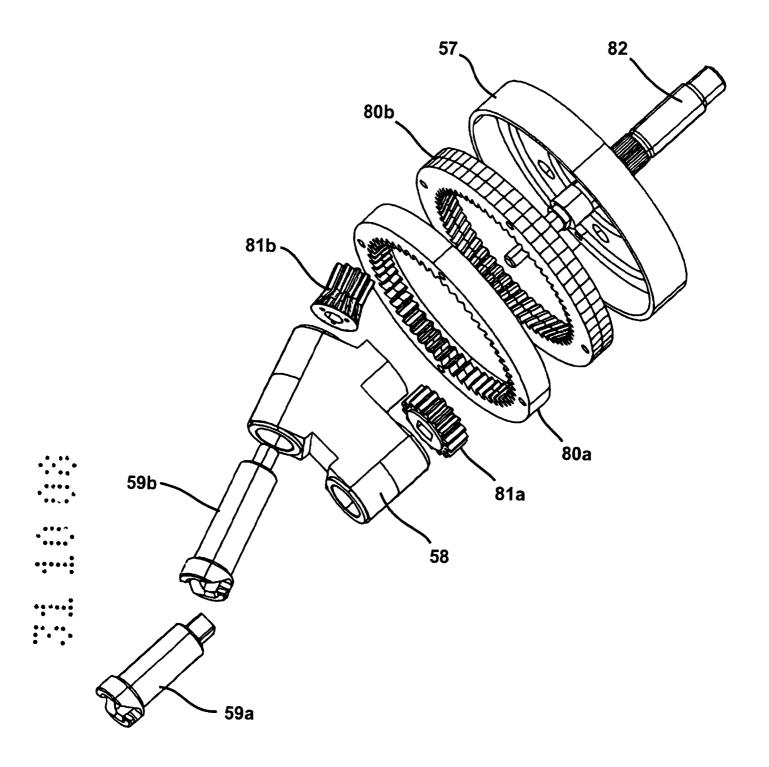


Fig 5

### PLANETARY DRIVE SYSTEMS

This invention relates to planetary drive systems and it relates especially to such systems intended for incorporation into stand mixers, by which is meant the kind of motor-driven kitchen machine in which a generally C-shaped casing provides a pedestal-like base for a mixing bowl, a generally upright support portion and a head unit which extends overhead of the pedestal and supports a downwardly-facing drive outlet for driving one or more mixer tools that perform a planetary mixing action in the bowl. The invention also encompasses a stand mixer incorporating such a planetary drive system.

5

10

20

25

Stand mixers such as, for example, the Kenwood Chef kitchen machine, are well known and have been well established in use for many years. Over the years, mixers of this kind have been adapted and developed so as to perform an ever broadening range of functions, and many such appliances provide, for example, a plurality of drive outlets disposed at differing locations on the appliance capable of running at different speeds and with differing torque characteristics, enabling them to perform a wide range of operations.

Recently, stand mixers such as that described in our co-pending UK patent application No. GB 2434760-A, have been provided with still broader operational capabilities, resulting from the inclusion of heating means provided to permit ingredients in the bowl to be heated whilst being subjected to the planetary mixing action; the heating being

selectable so as to completely cook, to partially cook, or to merely warm ingredients.

Whether or not heating facilities are provided in any given stand mixer, however, the ever-increasing number of different tasks which the tools driven from the planetary drive outlet overhead of the pedestal are required to perform places demands upon the planetary drive systems which are difficult to meet economically and with a high degree of competence, as expected by today's sophisticated users.

10

5

15

20

25

At two ends of the operational scale, for example, are the requirements for a relatively low speed, high torque drive for mixing heavy doughs, and a high speed drive for whisking relatively light liquids such as cream. In this respect, it has been proposed to provide a planetary drive with multiple speed drive outlets, but this proposal requires the provision of complex drive trains and is less than satisfactory in several respects.

This invention aims to provide an improved, multi-speed planetary drive system. Accordingly, and from one aspect, the invention provides a planetary drive system comprising a primary drive shaft capable of rotating a driving head unit about a first axis; said head unit supporting first and second drive outlets each capable of receiving and driving in rotation, relative to the head unit, a shaft of a respective tool; said drive system being configured to drive said first and second drive outlets at different speeds and about respective axes inclined with respect to one another.

By this means, not only is provision made for different tools to be driven at different speeds, but also the angles at which the respective tools are presented to a working bowl differ and the tools and their presentation can thus be optimised for effectiveness in their respective tasks.

5

10

Preferably, one of the tool shafts is disposed substantially parallel to the said first axis. By this means, a tool which operates well in an upright mode and which requires a relatively high torque drive, such as a dough hook, can be operated in its optimal orientation with respect to the bowl and its contents, on the one hand, and the drive system itself, on the other hand.

5

It is further preferred that the other tool shaft is inclined to the said first axis (and thus also to the first-mentioned tool shaft) at an angle of between 5 and 30 degrees, and most preferably between 10 and 22 degrees. By this means, a tool, such as a whisk, can be operated at relatively high speed and moreover presented at an angle which may be designed, for example, to optimise the entrapment of air into the substance being whisked

20

25

It is still further preferred that the primary drive shaft is configured to drive a carrier device bearing first and second planet gears relative respectively to first and second coaxially mounted ring gears; said first ring gear being provided with substantially straight-cut teeth and the second ring gear having teeth cut at a bevel angle related to the angle between said respective axes of the first and second drive outlets. By this means, the required speed differential between the two drive outlets can

be readily accommodated by appropriate design of the respective gear ratios and moreover the inclination between the axes of the two drive outlets is readily achieved.

In order that the invention may be clearly understood and readily carried into effect, certain embodiments thereof will now be described, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 shows, in perspective view, a conventional stand mixer;

10

Figure 2 shows the stand mixer of Figure 1 from a frontal elevation;

Figures 3a and 3b show, in side elevation, part of a stand mixer incorporating a planetary drive system in accordance with one example of the present invention;

Figures 4a and 4b show in underside plan view and cross-sectional view respectively, the drive system incorporated in the stand mixer shown in Figures 3a and 3b; and

20

Figure 5 shows an exploded view of the drive system shown in Figures 4a and 4b.

25

Referring now to Figures 1 and 2, in which corresponding features carry the same reference numbers, a conventional stand mixer 10 comprises a generally C-shaped casing 20, comprising a base part 30, which supports a bowl pedestal 40, and a head part 50, linked by a generally upright

casing portion 60. The casing 20 encloses an electric drive motor (which is not shown but is usually located in the generally upright portion 60 of the casing 20) and gearing (not shown) which conveys the motive power supplied by the motor to a plurality of drive outlets to which various tools can be attached to perform a wide variety of tasks in the kitchen.

5

10

20

25

In this particular example, the head part 50 supports a high-speed blender drive outlet (behind covers 51), a slow-speed mincer drive outlet (behind cover 52) and a planetary drive, intended for food mixing, at 53 (overhead of the pedestal 40) although it will readily be appreciated that more, fewer and/or different drive outlets can be provided in accordance with desired functionality of the stand mixer.

A shanked mixing tool, attached as is conventional, to a socket 54 of the outlet 53, will depend in use into a mixing bowl placed on the pedestal 40, and is configured to rotate about both the axis of the socket 54 and the central axis 55 of the outlet 53, thus performing a planetary mixing action. The necessary relationships between the relative shapes and dimensions of the bowl and the mixing tool to ensure thorough and repeatable mixing of ingredients are well known and established in use over many years.

As shown, the stand mixer 10 is, in this example, provided with a pair of latches 41, 42 extending from an outer wall 43 of the pedestal 40, which latches co-operate with components on the base of the bowl to form a bayonet latching system which ensures firm and ready location of the

bowl on its platform. Other latching systems, such as screw-threading for example, can be used as an alternative to bayonet latching if preferred.

The generally upright casing portion 60 of the housing 20 is configured with a break line 67, and a suitable mechanism to permit the head part 50 of the stand mixer to be hinged away from the pedestal 40, in order to facilitate the insertion and removal of the mixing tools and the bowl.

One embodiment of the present invention will now be described with additional reference to Figures 3a and 3b, which use the same reference numbers as Figures 1 and 2 for equivalent components and show, in side elevational view, salient elements of a stand mixer incorporating a planetary drive system in accordance with one example of the invention.

10

20

25

Referring now to Figure 3a, the stand mixer 10 is similar to that shown in Figures 1 and 2, except in the vicinity of the overhead planetary drive system. In Figure 3a, there is provided a twin-speed planetary drive system 56 in accordance with one embodiment of the invention, wherein a planet carrier 58 is configured to rotate relative to a gearbox casing 57 whilst simultaneously driving in rotation, about respective drive axes, first and second drive outlets 59a and 59b.

As can be seen, the drive outlets 59a and 59b are spatially separated on the carrier 58, and their drive axes are inclined to one another. In this example, the angle of inclination of the two drive axes is 22 degrees, but the invention is not limited to this specific angular relationship and those skilled in the art will realise that the relationship may be varied in

dependence upon a number of factors including, for example, the specific design and intended function of the tools intended to be employed with any particular drive system. It will also be observed that the drive outlet 59a is disposed with its axis substantially parallel to the planetary drive axis of the carrier 58, and is thus disposed with its drive axis substantially vertical.

In the exemplary embodiment shown in Figures 3a and 3b, the vertically oriented drive outlet 59a is shown in Figure 3a as receiving the shank 70 of a heavy-duty beater tool 71 and/or of a dough hook (not shown). Figure 3b shows the same stand mixer 10 but, in this instance, the inclined drive outlet 59b is shown as receiving the shank 75 of a whisking tool 76.

10

20

25

Typically, the whisking tool 76 requires to be driven at a speed significantly higher than that at which tools such as 71 are driven, so the gearing arrangement is such that the drive outlet 59b rotates significantly faster (say twice as fast) as the drive outlet 59a. The drive outlet 59a, however, is capable of delivering high torque, and its gears are straight cut, rather than bevelled as is the case with the drive outlet 59b.

It will readily be appreciated that the invention is not, in any manner, intended to be limited to the specific design of the tools 71 and 76; these tools being shown merely to exemplify the usage of the drive system. It will also be appreciated that the tools 71 and 76 would in practice depend into a bowl of suitable design but that the bowl has been omitted from the Figures to show the drive system and typical tool arrangements therefor.

Figures 4a and 4b show the drive system in more detail. From Figure 4a, which is an underside plan view of the system 56, it can be seen that the planet carrier 58 can be driven in rotation relative to first and second coaxially mounted, static ring gears 80a and 80b; the planet carrier 58 rotating bodily about the axis of the two ring gears. The carrier 58 supports first and second planet gears 81a and 81b (best seen in Figure 4b) and these planet gears drive respectively the first and second drive outlets 59a and 59b.

The first ring gear 80a is provided with straight-cut gear teeth intended to mesh with similarly straight-cut gear teeth on the planet gear 81a, so that the drive outlet 59a is disposed and driven vertically at a speed determined partly by the gearing 80a, 81a and partly of course by the intrinsic speed of the drive motor (not shown) which drives, directly or indirectly, a primary drive shaft 82 (Figure 4b) which is the prime mover of the system 56 and drives directly the carrier 58. It will be appreciated in this respect that any convenient and suitable form of drive motor can be used. However, an attendant advantage of utilising the drive system hereof is that the motor can, if desired, be run relatively fast to permit more efficient cooling and operation thereof; the outlet speeds being controlled by gearing selection.

Figure 5 shows the drive system of Figures 4a and 4b in an exploded view.

### Claims:

1. A planetary drive system comprising a primary drive shaft capable of rotating a driving head unit about a first axis; said head unit supporting first and second drive outlets each capable of receiving and driving in rotation, relative to the head unit, a shaft of a respective tool; said drive system being configured to drive said first and second drive outlets at different speeds and about respective axes inclined with respect to one another.

10

2. A system according to claim 1, wherein one of the tool shafts is disposed substantially parallel to the said first axis.

15

20

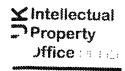
- 3. A system according to claim 2, wherein said one of the tool shafts supports a tool such as a dough hook or a beater intended for operation at relatively low speed compared to tools supported from the other shaft.
- 4. A system according to claim 2 or claim 3, wherein the other tool shaft is inclined to the said first axis (and thus also to the first-mentioned tool shaft) at an angle of inclination in the range from 5 to 30 degrees.
- 5. A system according to claim 4, wherein said angle of inclination is in the range from 10 to 22 degrees.
- 25 6. A system according to any of claims 2 to 5, wherein said other tool shaft supports a tool such as a whisk intended for operation at relatively

high speed compared to tools supported from the first-mentioned drive shaft.

7. A system according to any preceding claim, wherein the primary drive shaft is configured to drive a carrier device bearing first and second planet gears relative respectively to first and second coaxially mounted ring gears; said first ring gear being provided with substantially straight-cut teeth and the second ring gear having teeth cut at a bevel angle related to the angle between said respective axes of the first and second drive outlets.



- 8. A planetary drive system substantially as herein described with reference to and/or as shown in the accompanying drawings.
- 9. A stand mixer incorporating a planetary drive system according to any preceding claim.



For Creativity and Innovation

Claims searched:

**Application No:** GB0719636.3

1 - 9

Examiner:

Heather Webber

Date of search:

24 January 2008

# Patents Act 1977: Search Report under Section 17

## **Documents considered to be relevant:**

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1 - 6	GB 370851 A (AESCHBACH) see whole document
X	1 - 6	WO 2007/023122 A1 (BSH BOSCH UND SIEMENS HAUSGERATE GMBH) see abstract and figures 8 & 10 especially
A	-	US 4697929 A (MULLER) see whole document

### Categories:

X	Document indicating lack of novelty or inventive	A	Document indicating technological background and/or state
	step		of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category	Р	Document published on or after the declared priority date but before the filing date of this invention
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKCX:

Worldwide search of patent documents classified in the following areas of the IPC

A47J: B01F

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

## **International Classification:**

Subgroup	Valid From
0043/08	01/01/2006
0043/06	01/01/2006
0044/00	01/01/2006
0007/30	01/01/2006
0015/00	01/01/2006
	0043/08 0043/06 0044/00 0007/30