(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
27 June 2013 (27.06.2013)

W I P O | P C T

(10) International Publication Number
WO 2013/095165 Al

(51) International Patent Classification:
A01K 14/00 (2006.01) *B26B 19/24* (2006.01)
A01K 13/00 (2006.01) *B26B 19/32* (2006.01)
B26B 19/12 (2006.01) *F16H 21/52* (2006.01)

(21) International Application Number:
PCT/NZ20 12/000244

(22) International Filing Date:
21 December 2012 (21.12.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
597382 23 December 201 1 (23. 12.201 1) NZ

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available):* AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,

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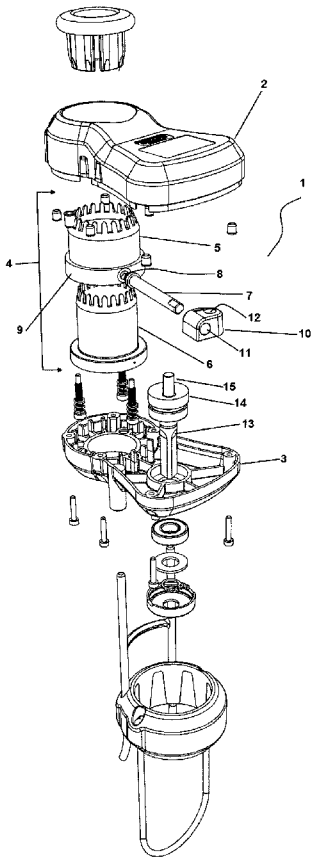
(54) Title: AN IMPROVED DRIVE MECHANISM FOR A PORTABLE POWER TOOL

FIGURE 1



(57) Abstract: This invention relates to a movement transfer mechanism for a portable power tool, such as a cutting device. The mechanism includes a movement transfer block, a shaft configured to be linked to a driving means, wherein the shaft includes a head configured to engage with the movement transfer block, a linking arm to a working element, which may be a cutting blade, the linking arm configured to engage with the movement transfer block, the mechanism characterised in that the movement transfer block includes a first aperture substantially in line with the head of the drive shaft, and a second aperture substantially in line with the linking arm of the working element. Rotation of the drive shaft causes reciprocal movement of the linking arm, and therefore movement of the working element with which the linking arm engages.

WO 2013/095165 A1

NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available):* ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

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

AN IMPROVED DRIVE MECHANISM FOR A PORTABLE POWER TOOL

TECHNICAL FIELD

This invention relates to an improved drive mechanism for a portable power tool. The present invention has particular application to the driving mechanism for a cutting device suitable for trimming animal hair from appendages such as animal tails.

However, it should be appreciated that the present invention can be readily applied to other applications.

BACKGROUND ART

Persons working with farm animals, for example cows, will appreciate that the hair and fur of such animals quickly becomes mattered with mud and faecal matter.

For cows, the tail is an obvious source of bacteria which could subsequently cause mastitis in the cow. Mastitis is a particularly undesirable bacterial infection which affects the quality of milk produced by the cow.

It is commonly believed in the dairy industry that the instance of mastitis in cows can be reduced somewhat through either tail trimming or docking. This reduces the available surface area on which dirt and detritus may collect.

The docking of cow tails is not always desirable due to the extra time and energy required to attend to this task. This is particularly true when the cow is part of a large herd of animals.

It has also been recognised that it is desirable for the comfort of a cow for it to be able to use its tail to swat away flies and the like, and this is another reason for a move away from

tail docking in the husbandry of cows.

Furthermore, docking of animal tails is no longer widely practiced in New Zealand, and many other countries, due to animal welfare issues.

However, this does mean that as noted above, the tail of a cow can become matted with mud, faecal matter and other types of dirt and detritus. When the tail contacts the udder, this transmits potentially mastitis causing bacteria.

A dirty and matted tail can also be undesirable for reasons other than an increased risk of mastitis.

For example, when the cow is in a dairy shed being milked, the operator of the milking equipment, who is usually positioned in a trench behind a row of milking stalls, can be hit in the face with a tail as he or she is attempting to put (or remove) the milking cup apparatus on the teats of the cow. This can be particularly unpleasant when the tail is covered with faecal matter and urine..

For these reasons, tail trimming is a common practice in the dairy industry. This is usually achieved with a pair of scissors or electric clippers. It is usually convenient to attend to the tail trimming when the cow is in a diary stall.

However, tail trimming using scissors or clippers can be particularly labour intensive and time consuming. For example, repetitive use of scissors can lead to user fatigue relatively quickly, particularly given the number of times the user has to articulate the grips of the scissors.

Electric clippers are easier to use, but are still time intensive as the operator has to work their way around the tail in multiple passes in order to fully trim the tail.

These difficulties may cause the person doing the trimming to be selective about which tails of the herd require trimming. Often this means that only the dirtiest tails tend to be selected for trimming.

However, mastitis can be caused by relatively insignificant amounts of bacteria which may be present even on what may be a relatively clean tail. It is preferable, although very impracticable to trim the tails of most if not all cows, rather than just the dirtiest.

One apparatus that provides a more expedient way of trimming cow tails is the cutting device disclosed in the present applicant's PCT Publication Application No. WO2010/085157. This discloses a cutting device that utilises a plurality of circular cutting blades, driven by a portable power tool such as a drill. The tail is simply passed through the centre of the blades. This arrangement generally means that fewer passes are required to trim the tail.

However, the movement transfer mechanism deployed in the cutting device to convert the rotational movement of the power tool into the rotational movement of the cutting blades involved a relatively complex arrangement of gears, or alternatively, a conrod.

In practice, the movement transfer mechanism is relatively difficult to maintain, requiring lubricant on the moving parts of the mechanism. Because of the large contact areas of the driving mechanism due to the gears, there is relatively high amount of friction. This is a greater drain on the battery of the power tool that drives the cutting device.

Furthermore, because of the arrangement of gears and conrod it is also difficult to assemble. This adds to the cost of manufacture of the cutting device.

It is an object of the present invention to address the foregoing problems or at least to provide the public with a useful choice.

All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinency of the cited documents. It will be clearly understood that, although a number of prior art publications are referred to herein, this reference does not constitute an admission that any of these documents form part of the common general knowledge in the art, in New Zealand or in any other country.

Throughout this specification, the word "comprise", or variations thereof such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

DISCLOSURE OF THE INVENTION

According to one aspect of the present invention, there is provided a movement transfer mechanism for a portable power tool, wherein the tool includes a working element, the mechanism including

a movement transfer block,

a drive shaft configured to be linked to a driving means, wherein the drive shaft includes a

head configured to engage with the movement transfer block,

a linking arm to the working element, the linking arm also configured to engage with the movement transfer block,

the mechanism characterised in that

the movement transfer block includes a first aperture substantially inline with the head of the drive shaft, and a second aperture substantially inline with the linking arm of the working element.

According to one aspect of the present invention, there is provided a portable power tool, the tool including a driving means, a working element and a movement transfer mechanism linked to the working element, the movement transfer mechanism including

a movement transfer block,

a drive shaft configured to be linked to the driving means, and wherein the drive shaft includes a head configured to engage with the movement transfer block,

a linking arm configured with a first end to engage with the working element, and a second end configured to engage with the movement transfer block,

the portable power tool characterised in that

the movement transfer block includes a first aperture substantially inline with the head of the drive shaft, and a second aperture substantially inline with the linking arm of the working element.

According to another aspect of the present invention there is provided a method of using a portable power tool substantially as described above,

the method characterised by the steps of

a) activating the driving means such the drive shaft rotates, thereby causing translation of the rotational motion of the drive shaft into linear or rotational movement of the working element via the movement transfer mechanism; and

b) passing the working element over a surface to be worked.

According to another aspect of the present invention, there is provided a movement transfer mechanism for a cutting device, wherein the cutting device includes a substantially circular cutting blade, the mechanism including

a movement transfer block

a drive shaft configured to be linked to a driving means, wherein the shaft includes a head configured to engage with the movement transfer block,

a linking arm to the cutting blade, the linking arm also configured to engage with the movement transfer block,

the mechanism characterised in that

the movement transfer block includes a first aperture substantially inline with the head of the drive shaft, and a second aperture substantially inline with the linking arm of the cutting blade.

According to another aspect of the present invention, there is provided a cutting device including a substantially circular cutting blade, the cutting device including a movement transfer mechanism linked to the cutting blade, the movement transfer mechanism including

a movement transfer block,

a drive shaft configured to engage with a driving means, and wherein the shaft includes a head configured to engage with the movement transfer block,

a linking arm configured with a first end to engage with the cutting blade, and a second end configured to engage with the movement transfer block,

the cutting device characterised in that

the movement transfer block includes a first aperture substantially inline with the head of the drive shaft, and a second aperture substantially inline with the linking arm of the cutting blade.

According to another aspect of the present invention there is provided a method of using a cutting device substantially as described above,

the method characterised by the steps of:

a) connecting a portable power tool to the shaft of the movement transfer mechanism of the cutting device; and

b) passing a limb of an animal through the blades of the cutting device.

The present invention provides a simple and easily assembled movement transfer mechanism for a portable power tool such as a cutting device, where the movement transfer mechanism includes a block or cube configured to receive the drive shaft of the power tool and the linking arm to the working element (which may be a cutting blade) of the tool. Rotation of the drive shaft causes reciprocal movement of the linking arm, and therefore movement of the working element with which the linking arm engages.

A portable power tool should be understood to mean any power tool which is portable and uses moving working elements. For example, the power tool may be an orbital sander or cordless drill.

In preferred embodiments of the present invention, the power tool is a cutting device and reference as such shall now be made throughout the remainder of the present specification. However, a person skilled in the art will appreciate that the use of the present invention is not meant to be limiting and other applications for the invention are readily envisaged.

In preferred embodiments of the present invention, the cutting device includes a cutting assembly having at least a cylindrical inner blade and a cylindrical outer blade arranged concentrically inside each other. The blades are therefore configured with a passage through their centres.

It will be appreciated that the passage encompasses the surface to be worked, which in preferred embodiments of the invention is the tail of a cow.

However, this is not meant to be limiting and the configuration of the blades, and indeed the working elements will depend on the requirements of the user and the surfaces to be worked.

Preferably, the blades are configured with teeth about their upper circumferences.

Preferably, the inner blade is fixed relative to the outer blade, such that the outer blades rotates about the inner blade.

This is preferred as the interior portion of the inner blade defines the passage and thus the surface of the blades that may come into contact with the tail to be trimmed. The

arrangement of the blades means the cutting surfaces are where the teeth of the outer blade passes over the teeth of the inner blade. Arranging the blades in this way means that there is less risk of injuring the animal when using the present invention.

The cutting device includes a drive shaft linked or configured to be linked to a driving means.

In preferred embodiments of the present invention, the cutting device has an independent driving means in the form of a cordless drill or the like, such as those typically manufactured by Ryobi™, Black & Decker™ and Makita™. These tools have a motor connected to the driving means. However, this is not meant to be limiting and cordless drills produced by other manufacturers may be used with the present invention.

An advantage of using a cordless drill is that its motor has an internal power source in the form of a battery, and therefore does not require any electrical lines to a separate power source.

In preferred embodiments of the present invention, the drive shaft engages with the chuck of the cordless drill. Thus, the actuation of the drill causes rotation of the drive shaft.

However, it is not beyond the scope of the present invention that the cutting device includes an internal driving means such as a motor or the like integrally linked to the drive shaft (although a source of power, such as a battery will also be required and this, together with the motor, adds additional weight to the cutting device).

The movement transfer mechanism should be understood to mean a mechanism which translates the motion of the drive shaft of the present invention into movement of the working element.

The movement transfer mechanism of the present invention includes the drive shaft as described above, a linking arm having a first end and a second end, and a movement transfer block.

The linking arm should be understood to mean the portion of the movement transfer mechanism that engages with at least one of the working elements with which the invention is to be used.

In preferred embodiments of the present invention, the outer blade of the cutting assembly engages with the linking arm, which in turn engages with the movement transfer block.

In preferred embodiments of the present invention, the outer blade includes a rim about its non-cutting end. This assists in locating the blade assembly within the cutting device.

The linking arm includes a first end configured to engage with an aperture or recess in the rim of the outer blade (or with whatever working element is to be used). The first end may be in the form of a peg or the like.

It should be appreciated that in preferred embodiments of the present invention, the peg is not fixed and/pr locked in the aperture of the outer blade but instead is able to move slightly within the aperture, but without becoming disengaged from the blade. This helps compensate for the movement of the blade. It will be appreciated that this means the length of the peg and the depth of the aperture need to be dimensioned appropriately.

This arrangement also allows the movement transfer mechanism to be self-aligning, an important advantage of the present invention. The degree of movement allowed by the peg within the blade compensates for blade wear, adjustment or misalignment of the housing and bearings. Effectively, the peg "floats" within the blade.

The movement transfer block should be understood a structure that is configured to engage with both the drive shaft and the linking arm. The block converts the rotational movement of the drive shaft into linear or rotational (depending on the requirements of the user) movement of the linking arm.

In preferred embodiments of the present invention, the block is a cube having six faces. However, this is not meant to be limiting, and a person skilled in the art will appreciate that the block may take a variety of forms depending on the requirements of the user and tool with which the invention is to be used.

For example, the block may be substantially in the form of a sphere. Alternatively, a more rectangular form for the block may be desired, depending on packaging requirements. One consideration that needs to be made for the shape of the block is that it must be of a sufficient size to allow for a suitable working stroke of the cutting blades (or whatever working element is to be used).

The block is configured with a first aperture or recess complementary to the second end of the linking arm.

The block includes a second aperture or recess complementary to the head of the drive shaft.

It should be understood that in many power tools, the orientation of the working elements, such as the cutting blades of the present invention, may be substantially at right angles to the driving mechanism of the power tool. In other tools, the working stroke of the working element is in a direction that is substantially at right angles to the motion of the driving mechanism.

In preferred embodiments of the present invention, the first and second apertures are substantially perpendicular to each other. The first aperture is substantially inline with the end of the linking arm and the second aperture is substantially inline with the head of the drive shaft. Thus, it will be understood that arranging the apertures in this way means that the linking arm and drive shaft are substantially at right angles to each other.

In preferred embodiments of the present invention, the drive shaft is configured with a head, the head including an offset pin. By this, it should be understood that the elongate orientation of the pin is laterally offset from the elongate orientation of the drive shaft. Therefore, rotation of the drive shaft causes the pin to scribe a circle, the diameter of which is dependent on the degree to which the pin is laterally offset from the drive shaft.

It is the pin of the drive shaft which engages with the second aperture of the block.

The degree to which the pin is offset from the drive shaft may vary according to the requirements of the user. Generally, the greater the extent to which the pin is offset, the larger the working stroke of the cutting blades (or whatever working element is to be used).

Persons skilled in the art will appreciate that the working stroke (the extent to which the blades move) of the cutting blades may also be determined by the degree in which the first and second apertures of the block are laterally separated from each other.

It will be appreciated that as the drive shaft rotates, the pin of the drive shaft causes the rotational movement of the block. This movement is translated into substantially linear movement of the linking arm, thus driving the outer blade relative to the inner blade.

The end of the linking arm and the pin of the drive shaft are not fixed within the recesses of the block. Instead they are free to move deeper into the recesses, depending on their

respective positions as the driveshaft, and therefore the block rotates. The block effectively "floats" between the drive shaft and the linking arm.

This is important as no fastening components are required to engage the linking arm to the drive shaft. This minimises lubrication requirements. There may also be some slight lateral movement of the linking arm and pin within the recesses of the block as the block rotates. Such lateral movement would be difficult to compensate for if the linking arm and driveshaft was fixed relative to the block.

Furthermore, this feature of the invention contributes to the self-aligning aspect of the movement transfer mechanism, which as discussed previously, is an important advantage. The "floating" of the block helps to compensate for blade wear, adjustment or misalignment of the housing and bearings.

It will be appreciated that the pin of the drive shaft, the second end of the linking arm, and the depth of the apertures may need to be dimensioned appropriately to allow the "floating" of the block without the linking arm and drive shaft becoming disengaged.

In preferred embodiments of the present invention, the cutting device is provided with a housing to constrain the relative parts of the device.

In use, the user would fit the cutting device including the movement transfer mechanism to a portable power tool, such as a cordless drill. The driveshaft is inserted and tightened into the chuck of the drill. When the drill is activated, the rotation of the drill chuck also rotates the driveshaft. In turn, the movement transfer block rotates, by virtue of the offzset pin of the head of the drive shaft. This rotary movement moves the linking arm in a substantially back and forth movement, driving the cutting blades. The cutting blades can then be passed over the surface to be worked.

The tail of a cow can be passed through the passage defined at the centre of the blades, which as they rotate, trim the hair and any matter detritus from the tail. This can be achieved quickly and easily. Because the cutting surfaces are circular, greater coverage of the tail is achieved with fewer passes, meaning less manual work (and therefore less time as well) required in trimming of cow tails.

It would be appreciated that the present invention has a number of advantages, including:

- providing a quick, easy to use apparatus for trimming excess hair from the tails of animals;
- provides a self-aligning movement transfer mechanism meaning that the cutting device is less likely to be affect by wear of blades and misalignment of the various components of the cutting device;
- is easy to assemble and maintain;
- improves the hygiene of the animal due to reduction of surfaces to which dirt and detritus may accumulate; or
- at the very least, provides the public with a useful choice.

BRIEF DESCRIPTION OF DRAWINGS

Further aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the accompanying drawings in which:

Figure 1 is a perspective exploded view of one embodiment of the present invention;

Figure 2a is a top cross-section view of the cutting device illustrated in Figure 1; and

Figure 2b is a closer view of a portion of Figure 2.

BEST MODES FOR CARRYING OUT THE INVENTION

A cutting device (generally indicated by arrow 1) is illustrated in exploded form in Figure 1, and includes two halves of a housing (2, 3), which contains a circular cutting blade assembly (4).

The cylindrical outer blade (5) fits over the cylindrical inner blade (6) of the cutting blade assembly (4) and is provided with a linking arm (7).

The linking arm (7) is configured to be inserted into a suitably dimensioned aperture (8) in the rim (9) of the outer blade (5). The linking arm (7) is also inserted into a movement transfer block (10) via a suitable dimensioned aperture (11).

The block (10) includes a second aperture (12) substantially perpendicular and offset to the first (11), and this engages with the drive shaft (13) of the cutting device (1).

The drive shaft (13) is configured with a rotating head (14), to which an offset pin (15) is provided. It is this pin (15) which is inserted into the movement transfer block (10).

The block (10) effectively "floats" on the linking arm (7) and the pin (15) of the driveshaft (13). No fastening mechanisms are required to hold it in place. This is advantageous as the block (10) compensates not only for the vertical movement of the arm (7) and pin (15) but also some lateral movement as well.

It will be appreciated that as the drive shaft (13), which is configured to be inserted into a chuck of a cordless drill (not shown), is rotated, the head (14) of the drive shaft (13) also

rotates.

This rotational movement consequently causes the block (10) to rotate. This translates the movement of the drive shaft (13) into substantially linear movement of the linking arm (7).

Thus, the outer blade (5) rotates about the inner blade (6) of the cutting assembly (4).

The movement transfer block is better illustrated in Figures 2a and 2b.

Figure 2a is a cross-section top view of the cutting device (1) in an assembled form, although only the lower half (3) of the housing is depicted. It will be seen that the linking arm (7) is orientated substantially at right angles to the drive shaft (13).

The linking arm (7) includes a peg (16) to engage with the outer blade (5). The arm (7) passes back and forth through the movement transfer block (10) as the head (14) of the driveshaft (13) rotates.

Figure2b is a closer view of the portion of the invention circled (17) in Figure 2a. In this view not only is the linking arm (7) visible but also the offset pin (15) of the head (14) of the driveshaft (not visible).

The top (16) of the pin (15) is just visible. Because the pin (15) is offset, it passes through the block (10) behind the linking arm (7). The pin (15) does not undergo the degree of linear movement of the linking arm (7) and thus does not need to be particularly long, just sufficient sized to be reasonably located within the block (10).

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof as defined in the appended claims.

WHAT WE CLAIM IS:

1. A movement transfer mechanism for a portable power tool, wherein the tool includes a working element, the mechanism including

a movement transfer block,

a shaft configured to be linked to a driving means, wherein the shaft includes a head configured to engage with the movement transfer block,

a linking arm to the working element, the linking arm configured to engage with the movement transfer block,

the mechanism characterised in that

the movement transfer block includes a first aperture substantially inline with the head of the drive shaft, and a second aperture substantially inline with the linking arm of the working element.

2. The movement transfer mechanism as claimed in claim 1 wherein the movement transfer block is a cube having six faces.

3. The movement transfer mechanism as claimed in either claim 1 or claim 2 wherein the first and second apertures of the movement transfer block are substantially perpendicular to each other.

4. The movement transfer mechanism as claimed in any one of claims 1 to 3 wherein the head of the shaft includes an offset pin.

5. The movement transfer mechanism as claimed in claim 4 wherein the pin is configured to be inserted into the first aperture of the movement transfer block.

6. The movement transfer mechanism as claimed in claim 4 wherein the pin of the shaft is not fixed within the first aperture.

7. The movement transfer mechanism as claimed in any one of claims 4 to 6 wherein the first aperture is deeper than the pin of the shaft.

8. The movement transfer mechanism as claimed in any one of claims 1 to 7 wherein the linking arm includes a first end configured to be inserted into the working element.

9. The movement transfer mechanism as claimed in any one of claims 1 to 8 wherein the linking arm includes a second end configured to be inserted into the second aperture of the movement transfer block.

10. The movement transfer mechanism as claimed in claim 9 wherein the second end of the linking arm is not fixed within the second aperture.

11. The movement transfer mechanism as claimed in either claim 9 or claim 10 wherein the second aperture is deeper than the second end of the linking arm.

12. The movement transfer mechanism as claimed in any one of claims 1 to 11 wherein the movement transfer block converts rotational movement of the shaft into movement of the linking arm.

13. A portable power tool, the tool including a driving means, a working element and a movement transfer mechanism linked to the working element, the movement transfer mechanism including

a movement transfer block,

a drive shaft configured to be linked to the driving means, and wherein the shaft includes a head configured to engage with the movement transfer block,

a linking arm configured with a first end to engage with the working element, and a second end configured to engage with the movement transfer block,

the portable power tool characterised in that

the movement transfer block includes a first aperture substantially inline with the head of the drive shaft, and a second aperture substantially inline with the linking arm of the working element.

14. The portable power tool as claimed in claim 13 wherein the tool is a cutting device.

15. The portable power tool as claimed in either claim 13 or claim 14, wherein the driving means is the motor of a cordless drill, wherein the cordless drill includes a chuck.

16. The portable power tool as claimed in claim 15 wherein the drive shaft of the movement transfer mechanism is configured to engage with the chuck of the cordless drill.

17. The portable power tool as claimed in any one of claims 13 to 16 wherein the working element is a cutting assembly having at least a cylindrical inner blade and a cylindrical outer blade arranged concentrically inside each other.

18. The portable power tool as claimed in claim 17 wherein the inner blade is fixed relative to the outer blade, such that the outer blades is able to move about the inner blade.

19. The portable power tool as claimed in claim 18 wherein the blades are configured with teeth about their upper circumferences.

20. The portable power tool of any one of claims 17 to 19 wherein the outer blade includes a rim about its non-cutting end.

21. The portable power tool of claim 20 wherein the rim includes a recess for the first end of the linking arm.

22. A method of using the portable power tool as claimed in claim 13, wherein the

the method is characterised by the steps of

a) activating the driving means such the driveshaft rotates, thereby causing translation of the rotational motion of the driveshaft into linear or rotational movement of the working element via the movement transfer mechanism; and

b) passing the working element over a surface to be worked.

23. The method as claimed in claim 21 wherein the working element is a cutting assembly having at least a cylindrical inner blade and a cylindrical outer blade arranged concentrically inside each other thereby defining a passage.

24. The method as claimed in claim 22 wherein the surface to be worked is passed into the passage of the cutting assembly.

25. The method as claimed in claim 23 wherein the surface to be worked is the tail of a cow.

26. A movement transfer mechanism substantially as herein described in the Best Modes section of the specification and with reference to the accompanying figures.

27. A portable power tool substantially as herein described in the Best Modes section of the specification and with reference to the accompanying figures.

28. A method of using a portable power tool substantially as herein described in the Best Modes section of the specification and with reference to the accompanying figures.

FIGURE 1

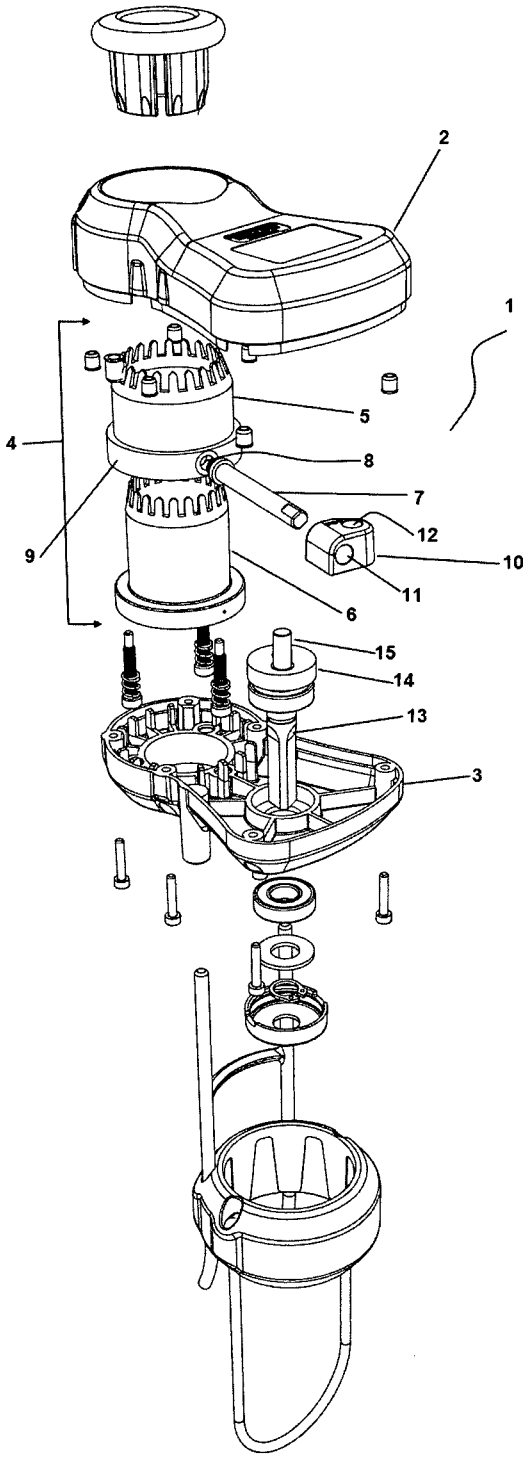


FIGURE 2A

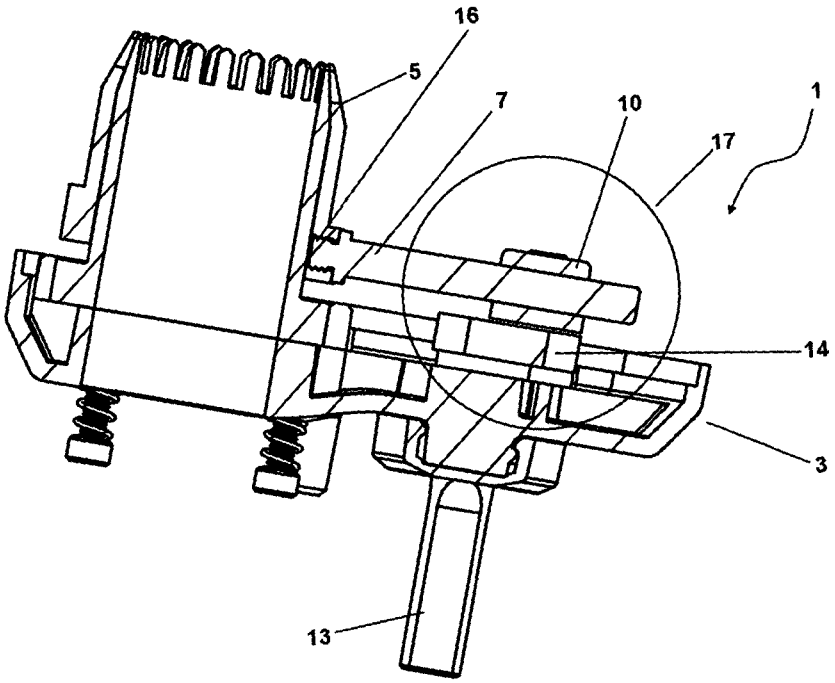
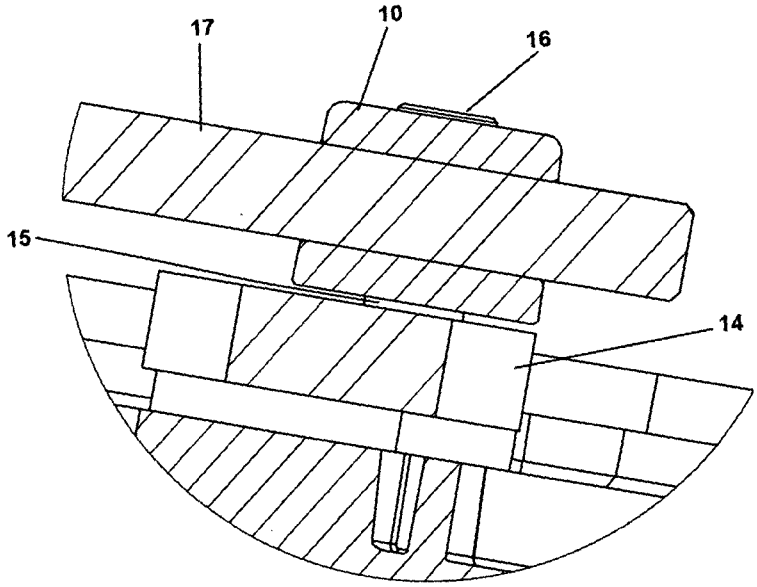


FIGURE 2B



INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ2012/000244

A. CLASSIFICATION OF SUBJECT MATTER

A01K 14/00 (2006.01) A01K 13/00 (2006.01) B26B 19/12 (2006.01) B26B 19/24 (2006.01) B26B 19/32 (2006.01) F16H 21/52 (2006.01)

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)

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: CPC & IPC: A01K13&14, B25F3&5, B26B15&25, B26B19/12,14,24&28, B26D1/44, F16H21/16/LOW, /40/LOW, 46/LOW, F16H25/14/LOW OR /LOW & KW (ROTATE, RECIPROCATE, OSCILLATE, CRANK, DRIVE, PIVOT, LEVER, ORTHOGONAL, SLIDE) and like terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] **Further documents are listed in the continuation of Box C** [X] **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

"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

"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	Date of mailing of the international search report
18 March 2013	18 March 2013

Name and mailing address of the ISA/All

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ2012/000244

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 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. [X] Claims Nos. : **26-28**

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:

See Supplemental Box

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 No. Ill Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

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

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 additional fees, this Authority did not invite payment of additional fees.

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. :

Remark on Protest

[ ] The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

[ ] The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

[ ] No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/NZ2012/000244**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X L	US 5768933 A (TANNER et al) 23 June 1998 Fig 1-5 Artilcle 6 Objection	1 & 4-14
X Y	US 2005/0060893 A1 (COMMINGES) 24 March 2005 Figl, Pari & Parl6 Figl, Pari & Parl6	1-6, 8-10, 12-14, 22 & 24 7, 11, 15-21, 23 & 25
Y	WO 2010/085157 A1 (SHOOF INTERNATIONAL LIMITED) 29 July 2010 Figl&2, Pgl l Ln5, Pg5 LnlO &Pg4 Lnl2	7, 11, 15-21, 23 & 25

Supplemental Box

Continuation of **Box II**

The claim/s do/does not comply with Rule 6.2(a) because it/they rely on references to the description and/or drawings.

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/NZ2012/000244**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
US 5768933 A	23 Jun 1998	CA 2188867 A1	06 Sep 1996
		EP 0757762 A1	12 Feb 1997
		EP 0757762 B1	21 Jul 1999
		JP H09512623 A	16 Dec 1997
		JP 3738029 B2	25 Jan 2006
		US 5768933 A	23 Jun 1998
		WO 9627093 A1	06 Sep 1996
US 2005/0060893 A1	24 Mar 2005	EP 1455992 A1	15 Sep 2004
		EP 1455992 B1	07 Dec 2005
		FR 2833881 A1	27 Jun 2003
		FR 2833881 B1	04 Jun 2004
		US 2005060893 A1	24 Mar 2005
		WO 03053641 A1	03 Jul 2003
WO 2010/085157 A1	29 Jul 2010	WO 2010085157 A1	29 Jul 2010

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.