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(56) Documents Cited:
GB 0356604 A **CN 203107449 U**
US 2522006 A **US 2344262 A**
US 1316252 A
KR 10-2011-0019410

(58) Field of Search:
INT CL **A61F**
Other: **EPODOC, WPI**

(54) Title of the Invention: **Cast cutting device**
Abstract Title: **Cast cutting device having a cast guide**

(57) The present invention provides a cast cutting device comprising a housing 12, 18; a blade 20 rotatable relative to the housing for cutting a cast; and a guide 24 for guiding the cast towards engagement with the blade 20. The guide 24 comprises a recess 26 to receive the cutting edge of the blade. The cast locates between the guide and the blade when the device is in use, so that the guide forms a buffer between the blade and the surface underneath the blade. A front portion 25a of the guide may be tapered and guides the cast to the blade, and a rear portion 25b supports the cast during cutting, the guide recess or channel being at least partially formed in the rear portion of the guide. The blade may have cutting sections 22 which are chamfered.

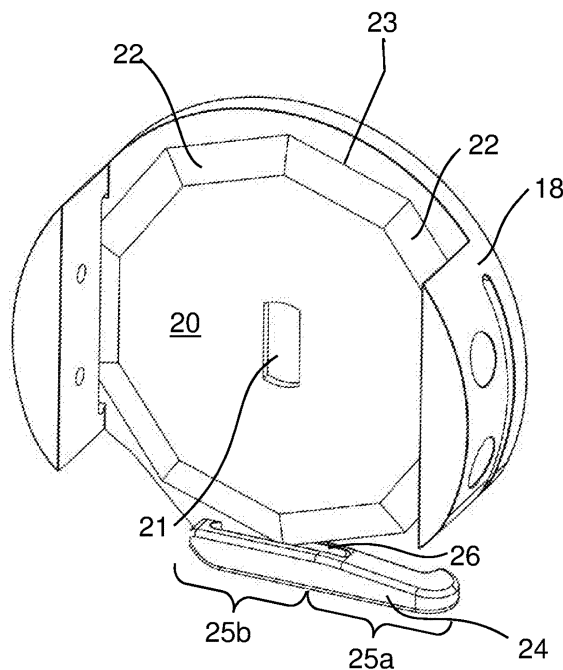


FIG. 7b

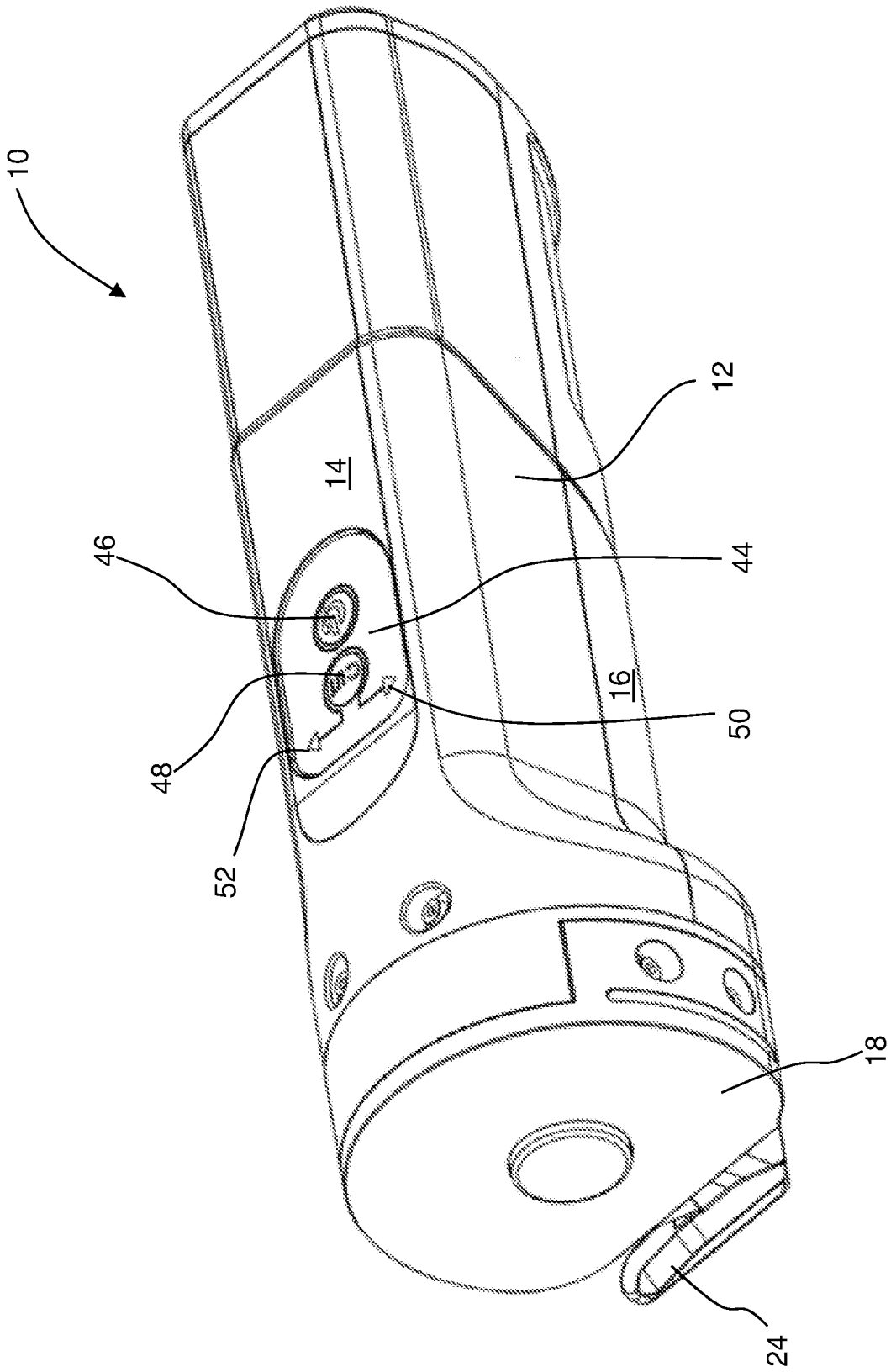


FIG. 1

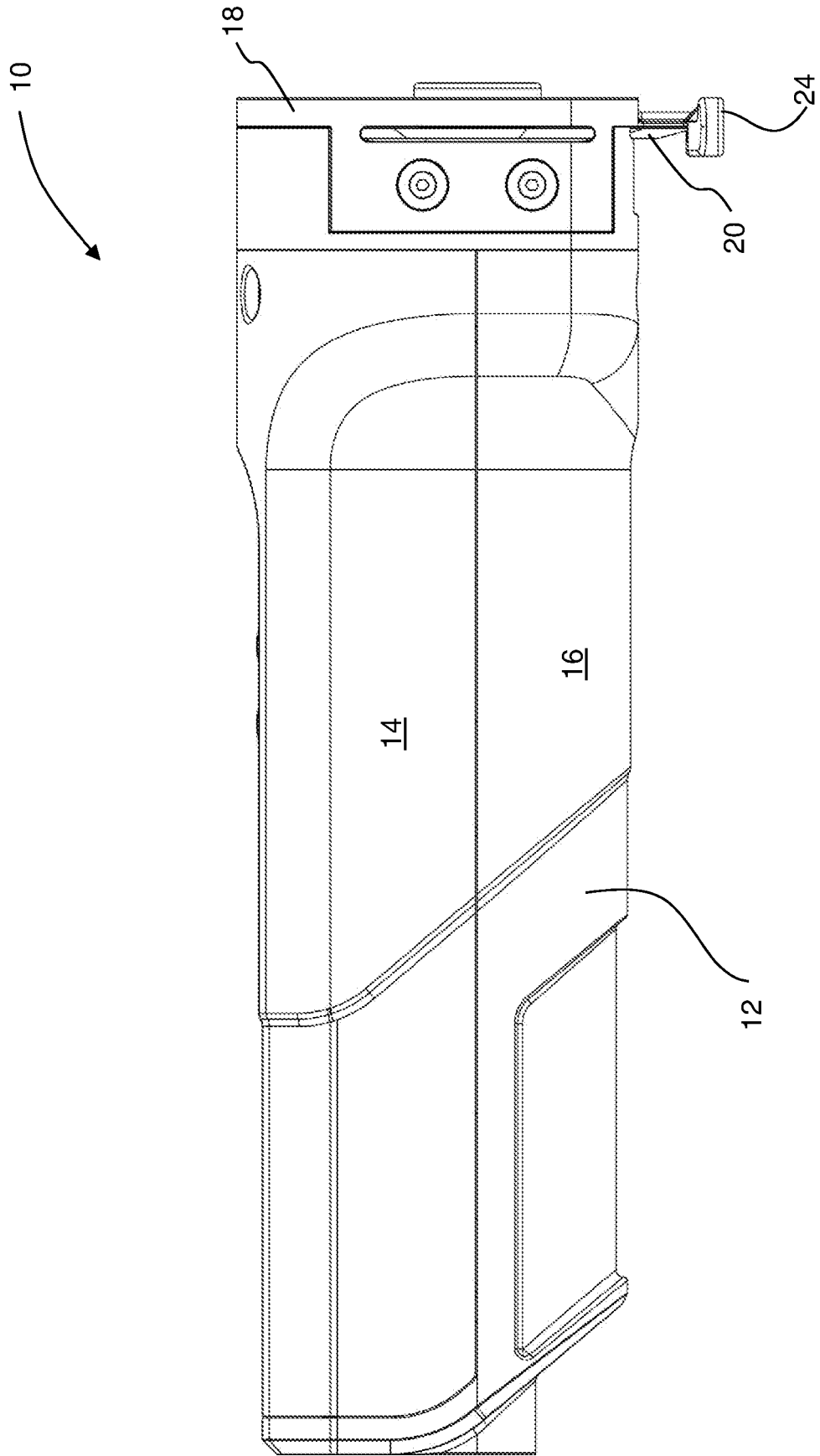


FIG. 2

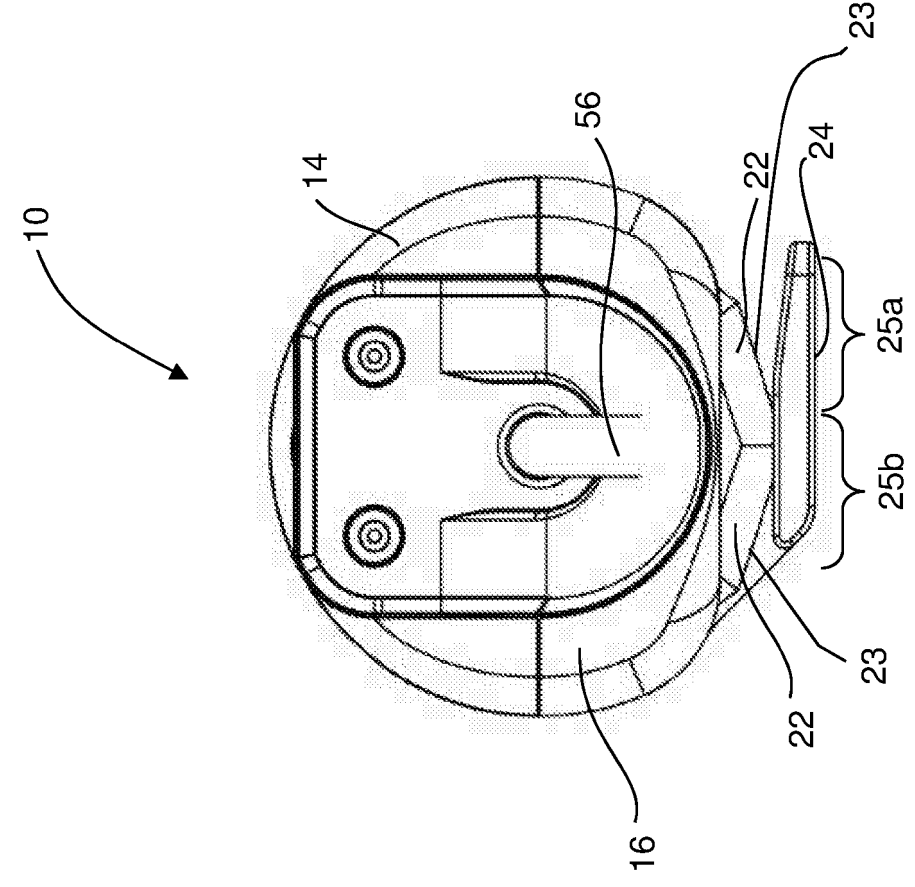


FIG. 3a

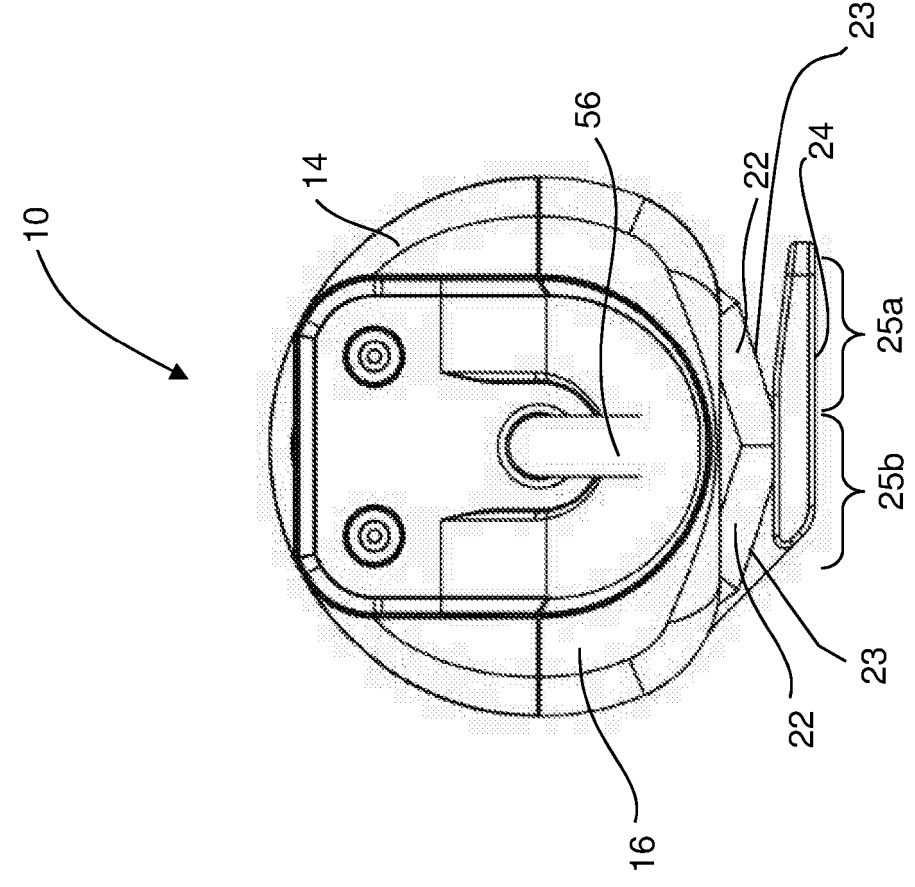


FIG. 3b

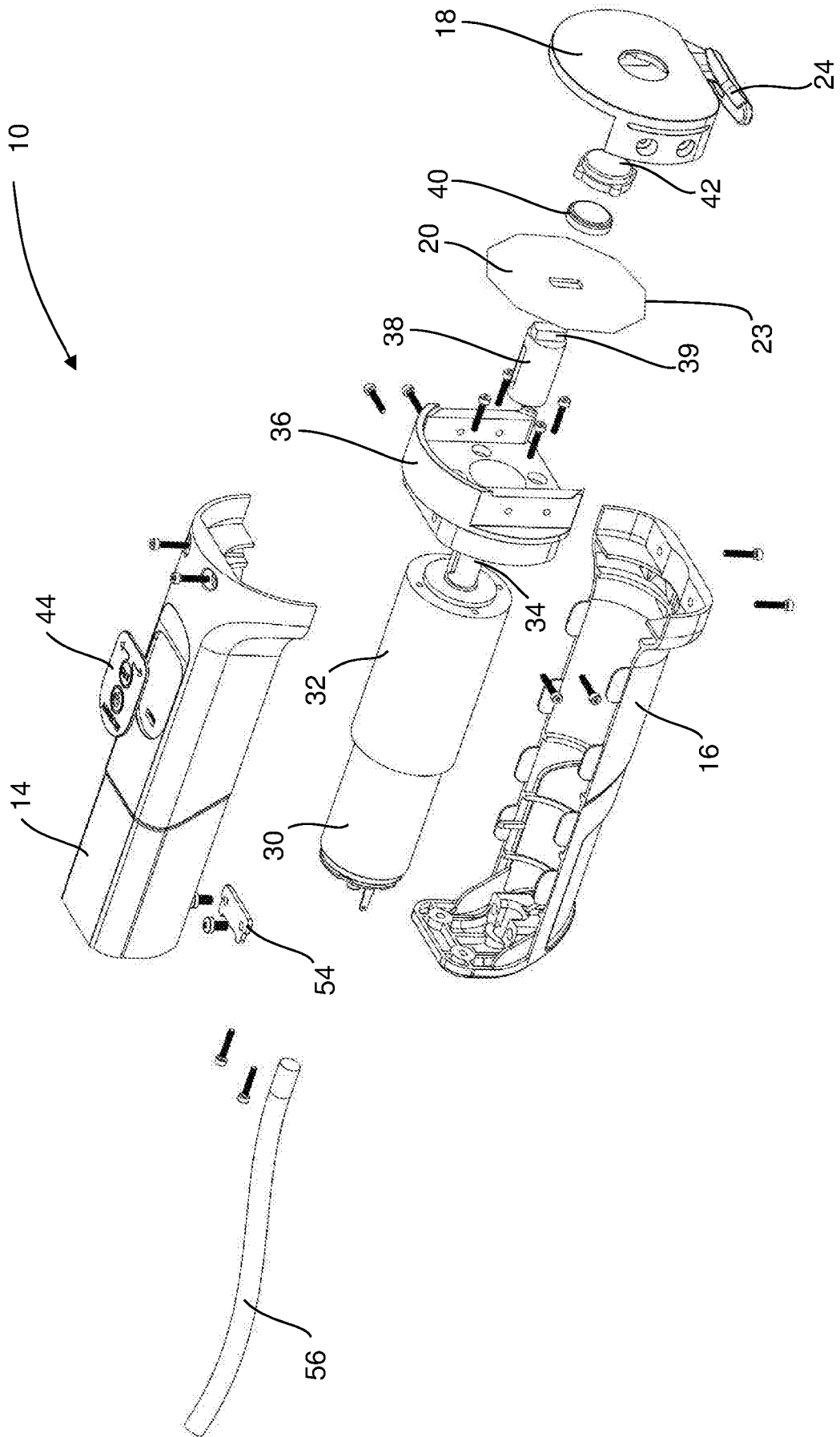


FIG. 4

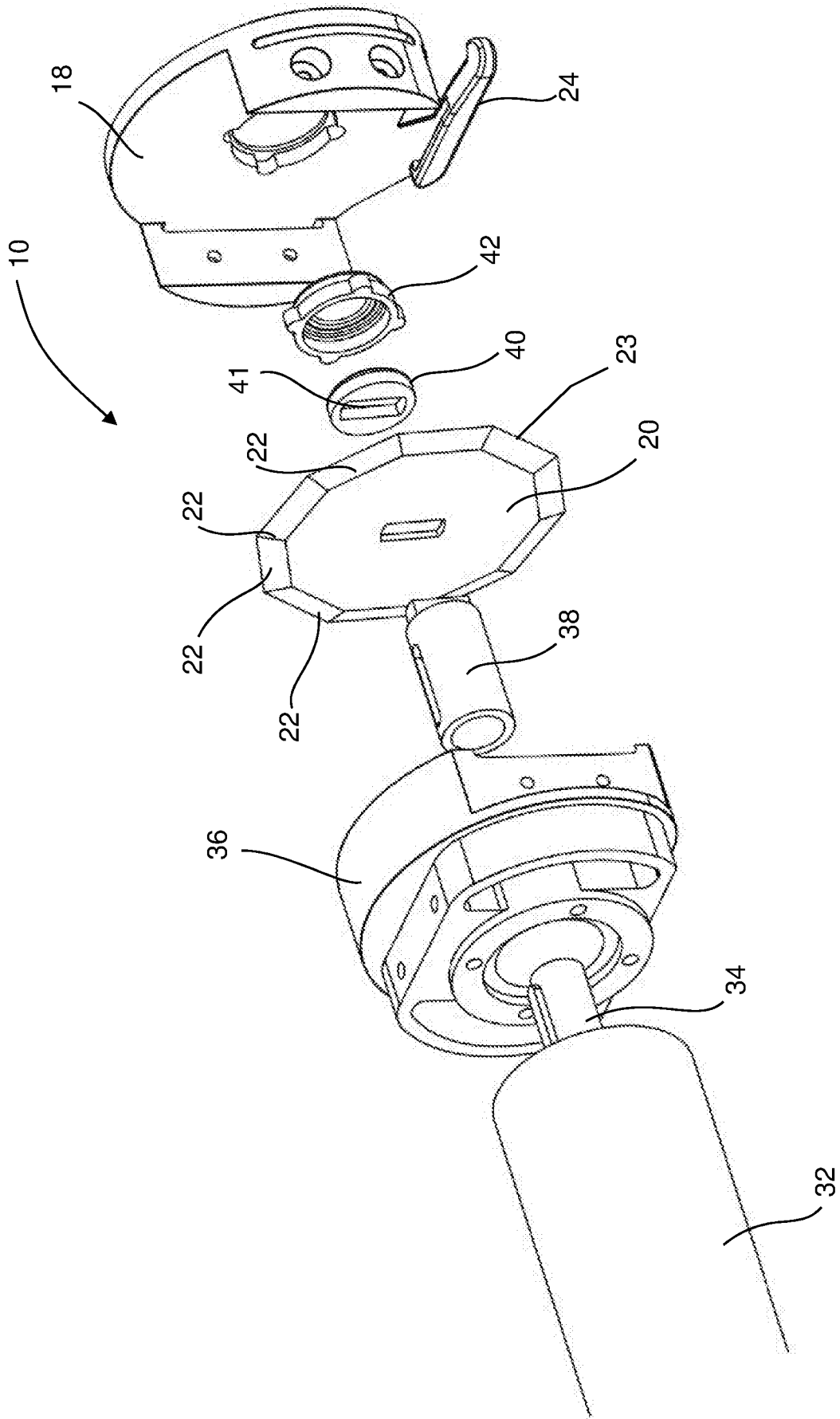


FIG. 5

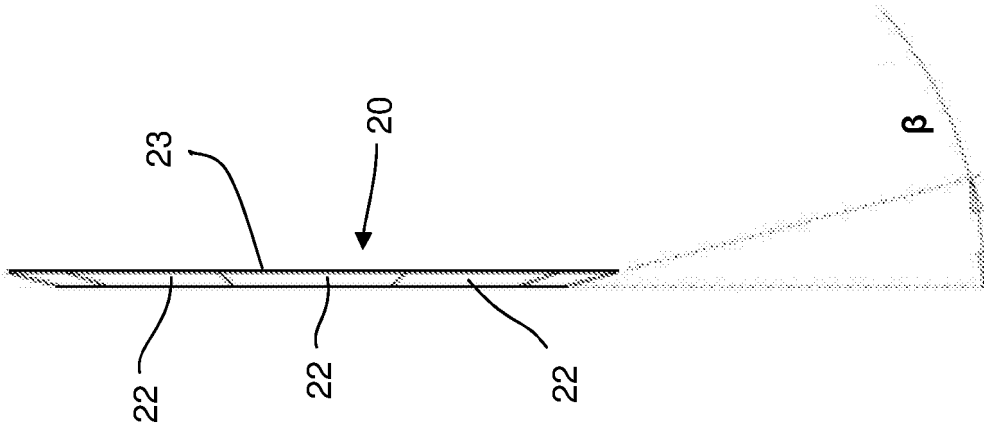


FIG. 6b

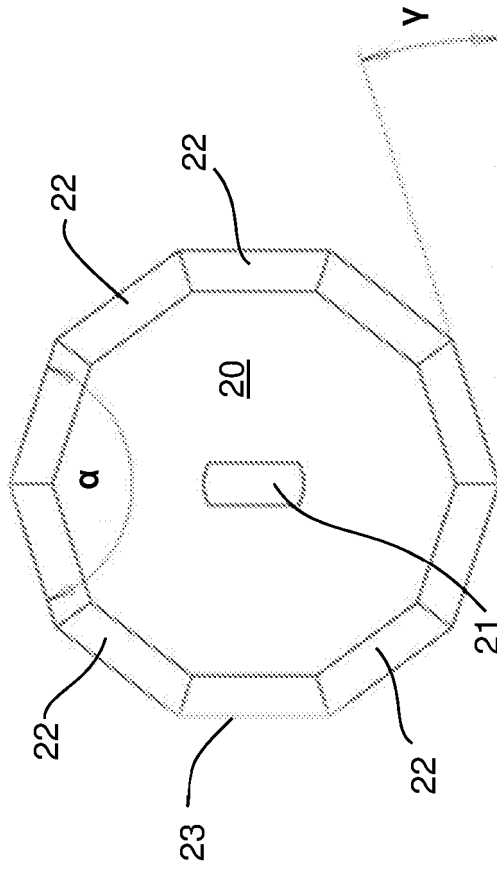


FIG. 6a

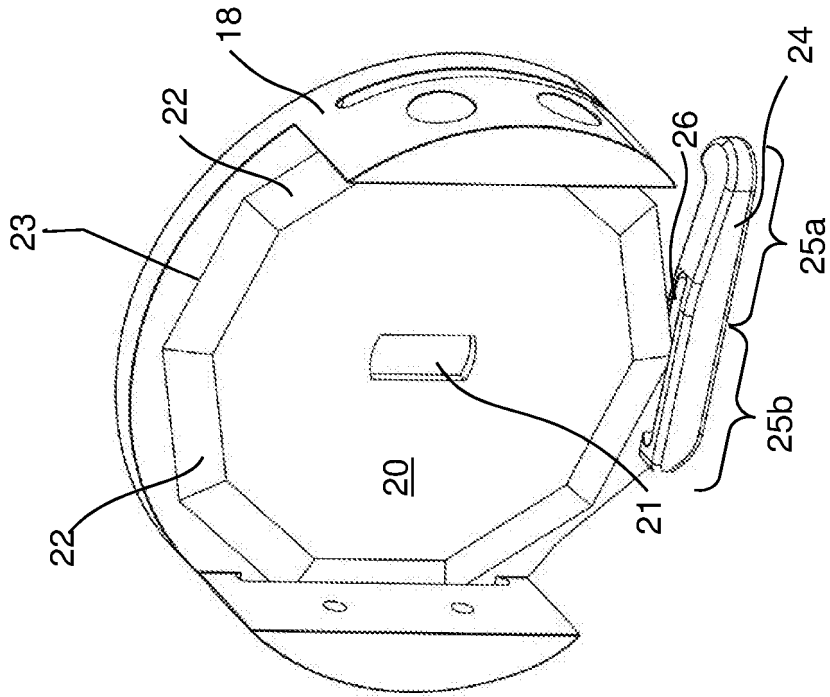


FIG. 7a

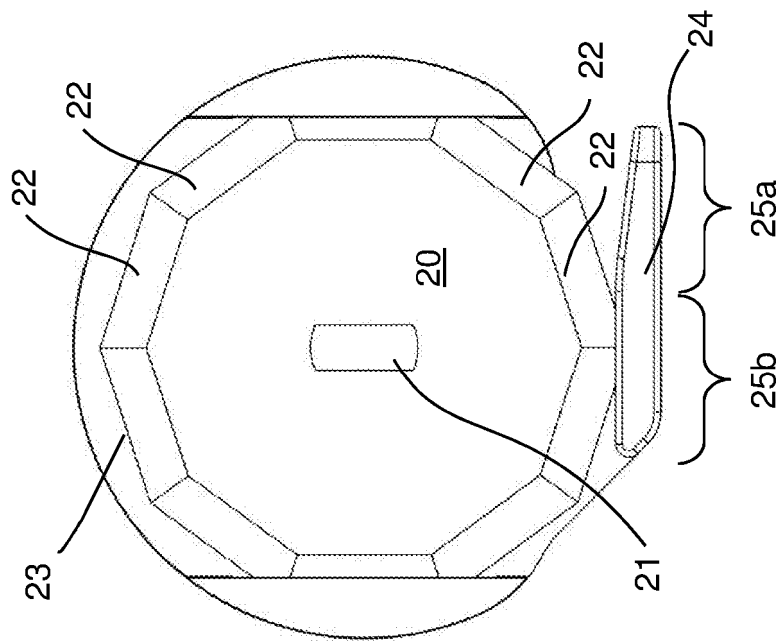


FIG. 7b

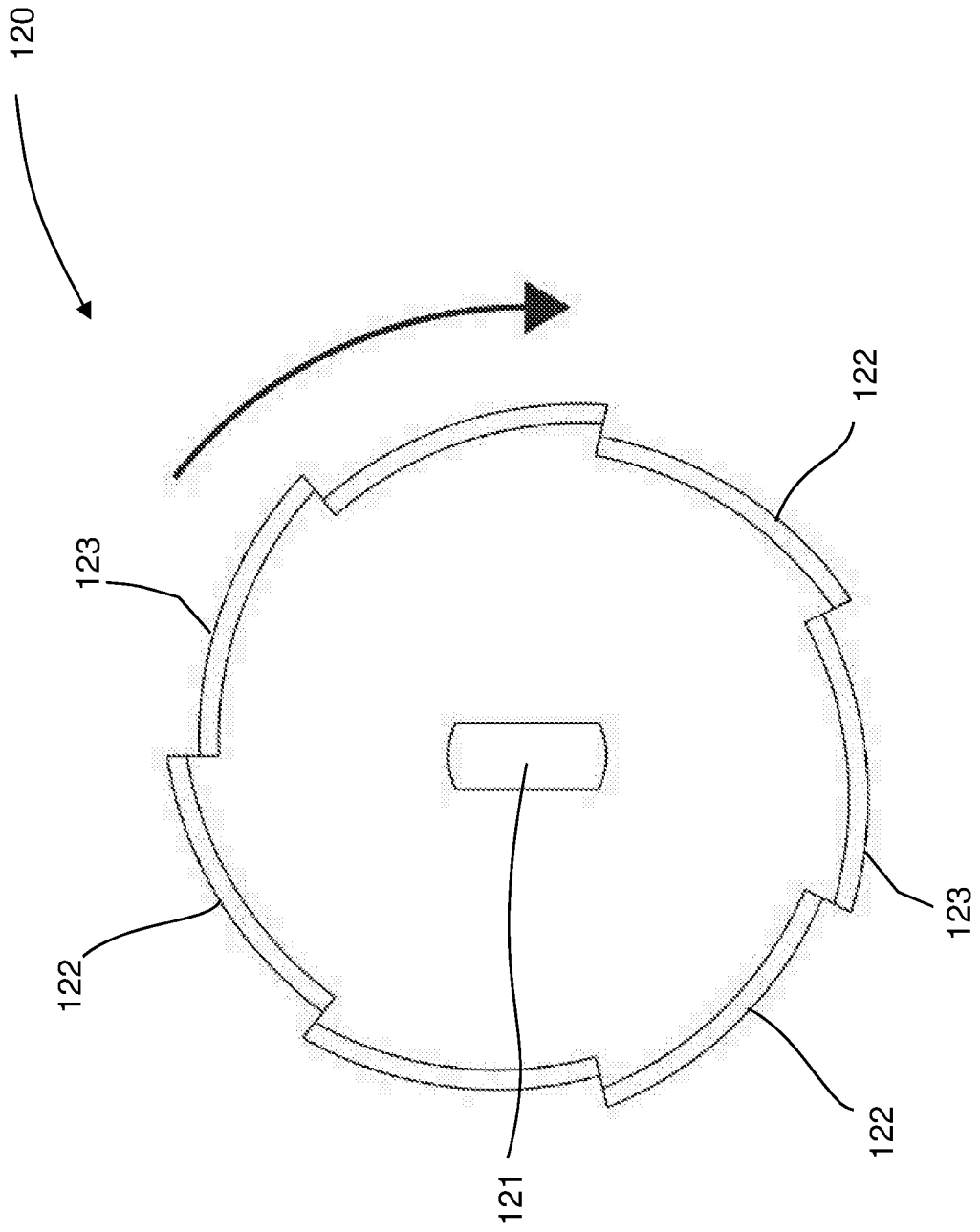


FIG. 8

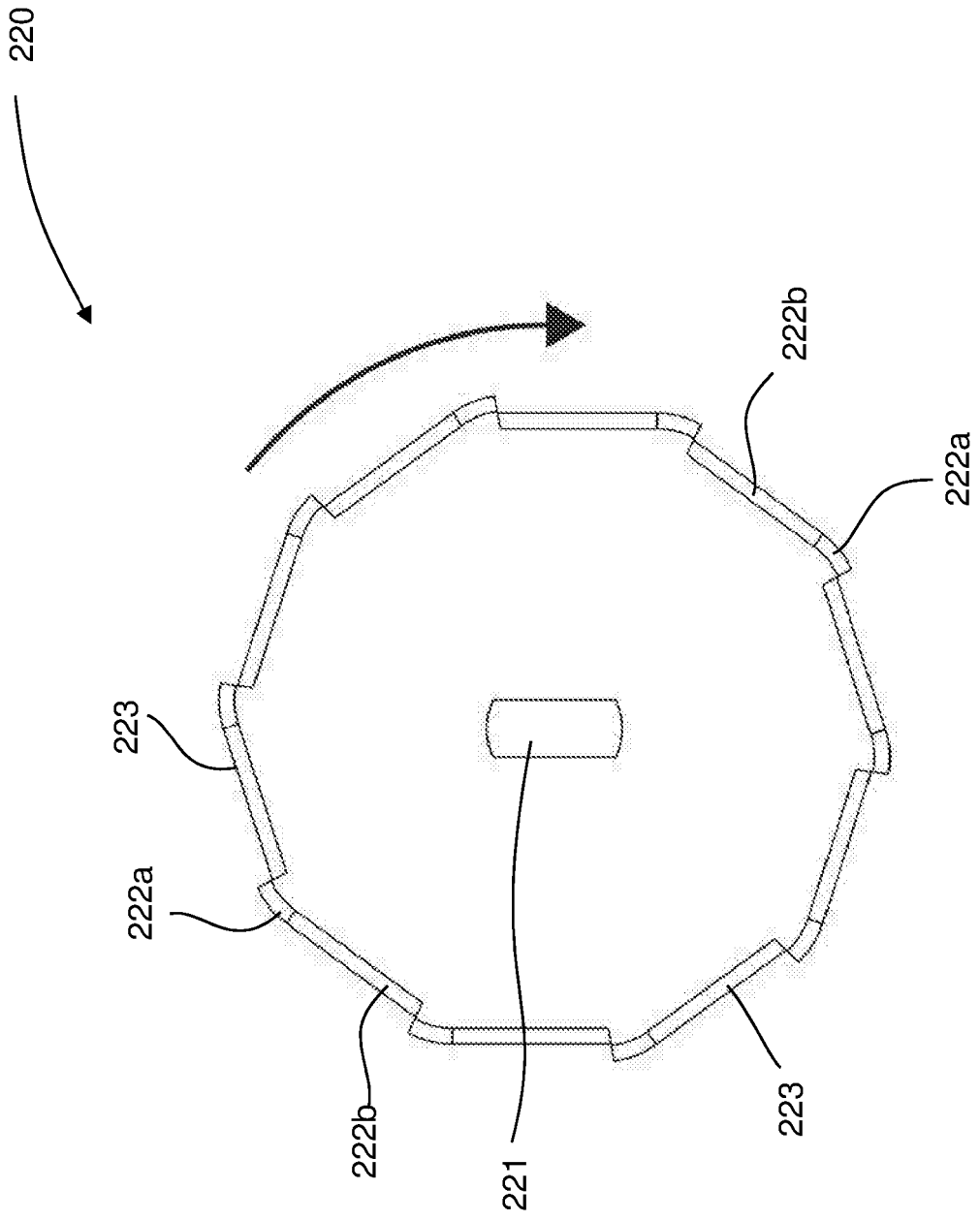


FIG. 9

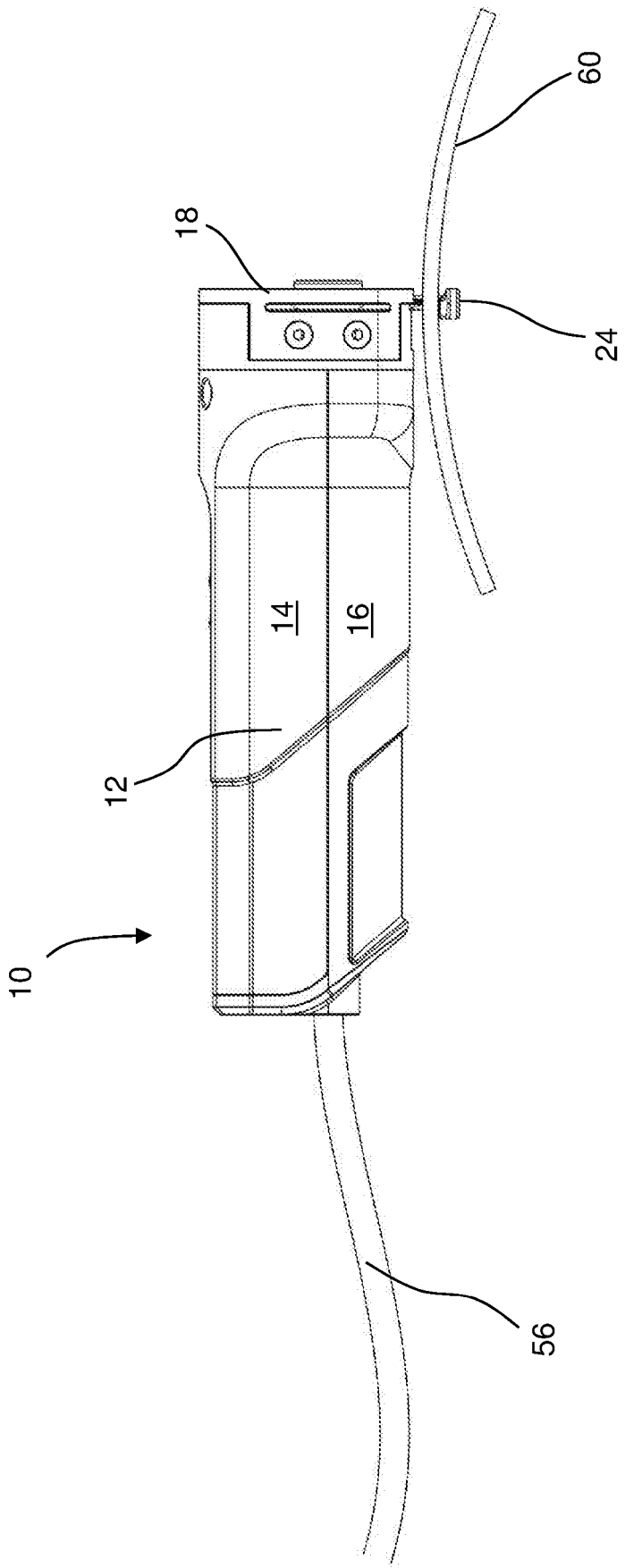


FIG. 10

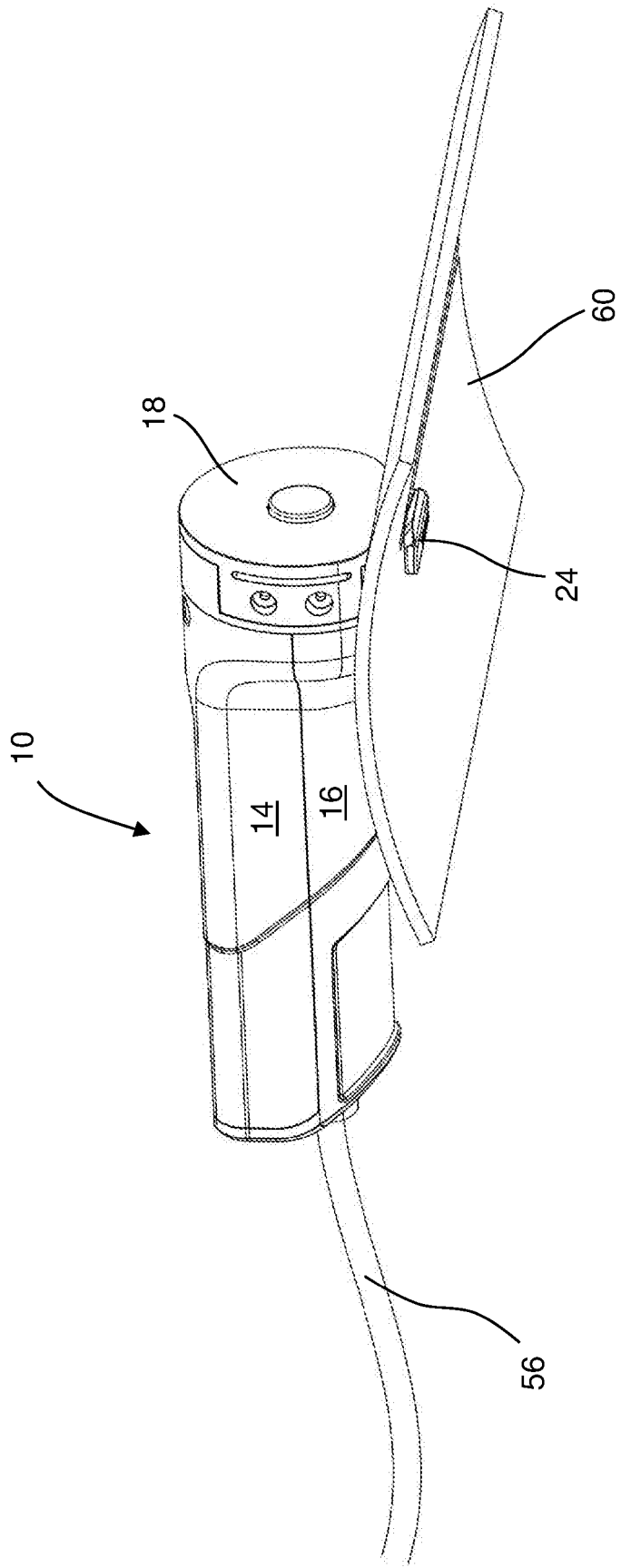


FIG. 11

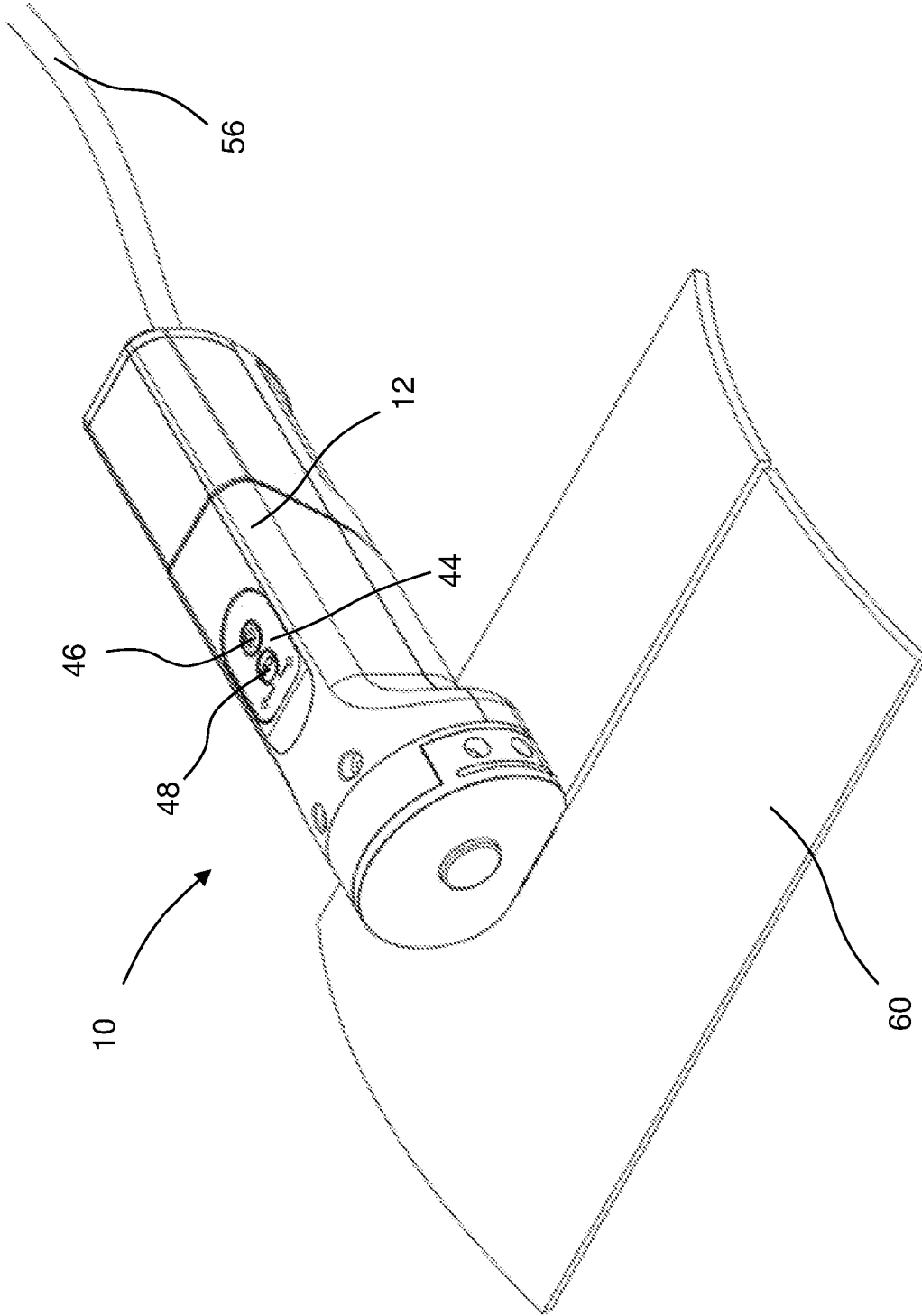


FIG. 12

Cast Cutting Device

FIELD OF THE INVENTION

5

The present invention relates to a cast cutter for the removal of orthopaedic casts from limbs or other parts of the body.

BACKGROUND OF THE INVENTION

10 It is common to remove an orthopaedic case such as a plaster cast from the limb or other body part of a patient by cutting the cast. It is known to cut a cast using an oscillating saw. However, there are drawbacks to such a tool. An oscillating saw operated at high speed, creating significant noise, can intimidate and/or alarm patients particularly young patients. Large amounts of dust are created as the cast is cut, which is particularly undesirable in a
15 clinical environment. The high speed at which the saw oscillates also causes the saw blade to heat up, increasing the risk of burning a patient. The vibrations created by an oscillating saw can also lead to repetitive strain injury to an operator.

It is also known to cut a cast using powered scissors. However, there are, again, downsides
20 to such a tool. Injury can be caused to a patient by the scissor movement. Powered scissors may be heavy and unwieldy, considerable effort may be required on the part of the operator to manipulate the scissors, and there is a risk of repetitive strain injury to the operator.

Both of the above tool types require multiple moving parts and complicated drive
25 mechanisms.

There is a need for an improved cast cutter.

SUMMARY OF THE INVENTION

30

The present invention seeks to address or mitigate at least some of the problems associated with conventional cast cutters. The present invention seeks to provide an alternative and improved cast cutter.

A first aspect of the invention relates to a cast cutting device comprising a housing; a blade for cutting a cast and a guide for guiding the cast towards engagement with the blade.

5 The blade is rotatably mounted on the housing so as to cut the cast as it rotates. By using a rotating motion, the blade is able to cut through the cast at a substantially lower speed than a conventional oscillating blade. Thus, the excessive heat, noise, dust and vibration problems associated with oscillating blades are advantageously avoided.

10 The guide is configured to be locatable under the cast during use and comprises a recess to receive the cutting edge of the blade. The guide acts as a protective buffer as the blade cuts through the cast. As a result, contact between the rotating blade and patient is inhibited.

The guide may comprise a forward portion and a rear portion.

15 The forward portion of the guide is preferably configured to direct the cast towards the blade so as to enhance cutting engagement with the blade. In an embodiment, the front portion of the guide is tapered so as to steer the cast towards the rear portion.

20 The rear portion of the guide is preferably configured to support a portion of the cast during cutting. This helps to stabilise the cast during the cutting process and restricts bending of the cast proximate the cutting area.

25 The recess may be any suitable shape to receive the blade. In an embodiment, the recess is a channel. The channel may be at least partially formed in the rear portion of the guide.

In an embodiment, the cutting edge of the blade may be divided into multiple cutting sections. Each of the multiple sections of the cutting edge may be substantially straight or curved.

30 The cutting edge may comprise a continuous circumferential profile or a discontinuous circumferential profile. In an embodiment, the discontinuous cutting edge may comprise at least one leading edge configured to engage the cast and move the cast in the direction of rotation. As result, the device requires less force in use to cut through the cast.

The blade may comprise a chamfered cutting edge.

5 The blade may be rotatable in both a clockwise and an anti-clockwise direction. By rotating in both directions, the blade is able to be rotated in a clockwise direction to cut the cast and rotated in an anti-clockwise direction so as to release the blade from the cast, for example if the blade becomes snagged during cutting.

10 The device may comprise a drive mechanism configured to rotatably drive the blade. By providing a drive mechanism, the user effort required to cut the cast is reduced and the user need only guide the device in a desirable direction across the cast. The drive mechanism may be located within the housing. The drive mechanism may be configured to rotate the blade at a speed of approximately 25 to 100 rpm.

15 The housing of the device may comprise a front cover plate. The guide may be fixedly or removably attached to the front cover plate.

The device may comprise a user display to indicate to a user the direction of rotation of the blade.

20 For safe use, the blade of the device is preferably substantially obscured from view by a portion of the housing.

25 To allow for easy handling, the housing preferably defines a handle extending at least substantially orthogonal to the longitudinal axis of the guide and at least substantially parallel to the pivot axis of the blade.

The cast cutting device is suitable for cutting any type of cast located on any part of a patient's body. In an embodiment, the cast cutting device may cut a plaster cast located on the arm of a patient.

30

A second aspect of the invention relates to a method of cutting a cast using a cast cutting device according to the first aspect of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

There now follows a description of a preferred embodiment(s) of the invention, by way of non-limiting example, with reference being made to the accompanying drawings, in which:

5

Figure 1 is a perspective view of a cast cutting device in accordance with an embodiment of the invention;

Figure 2 is a side view of the cast cutting device of figure 1;

10

Figures 3a and 3b are end views of the cast cutting device of figure 1;

Figure 4 is an exploded view of the cast cutting device of figure 3;

15

Figure 5 is an exploded view showing the components forming part of the cast cutting device of figure 1.

Figure 6a is a schematic view of a first embodiment of a blade for use in the cast cutting device of figure 1;

20

Figure 6b is a schematic side view of the blade of figure 6a;

Figures 7a and 7b are view showing the positioning of the blade relative to the guide and recess of the cast cutting device;

25

Figure 8 is a schematic view of a second embodiment of a blade for use in the cast cutting device of figure 1;

Figure 9 is a schematic view of a third embodiment of a blade for use in the cast cutting device of figure 1;

30

Figures 10 to 12 are views depicting the cutting of a cast using the cast cutting device of the invention.

DETAILED DESCRIPTION OF EMBODIMENT(S)

5 The preceding discussion of the background to the invention is intended only to facilitate an understanding of the present invention. It should be appreciated that the discussion is not an acknowledgement or admission that any of the material referred to was part of the common general knowledge as at the priority date of the application.

10 Throughout the description and claims of this specification, the words “comprise” and “contain” and variations of the words, for example “comprising” and “comprises”, mean “including but not limited to”, and is not intended to (and does not) exclude other components, integers or steps.

15 Throughout the description and claims of this specification, the singular encompasses the plural unless the context otherwise requires. In particular, where the indefinite article is used, the specification is to be understood as contemplating plurality as well as singularity, unless the context requires otherwise.

20 Features, integers or characteristics, and compounds described in conjunction with a particular aspect, embodiment or example of the invention are to be understood to be applicable to any other aspect, embodiment or example described herein unless incompatible therewith.

25 Referring to figures 1 to 5, an embodiment of a cast cutting device 10 in accordance with the invention is shown.

The cast cutting device 10 comprises a housing 12, a blade 20 for cutting a cast, and a guide 24 for guiding the cast towards engagement with the blade 20.

30 In this embodiment, the housing 12 comprises a top case section 14, a bottom case section 16 and a front cover plate 18. The top and bottom case sections 14, 16 are made from a material that is suitable for use in a class 1 medical device. For example, the material may be a glass reinforced material, a plastics material such as ABS or similar thermoplastic material etc.

In the embodiment shown, the top case section 14 and the bottom case sections are made from injection moulded smooth plastic.

5 The front cover plate 18 is also made from a material that is suitable for use in a class 1 medical device. In the embodiment shown, the front cover plate 18 is made from a plastics material and may be produced by an injection moulding process.

While the front cover plate 18 is shown as a single component, it may be a multiple component part. For example, it may comprise a thin metal part and a plastic part.

10

The blade 20 is supported and rotatable with respect to the housing 12. In this embodiment, the blade 20 comprises a polygonal circumferential profile and is made of stainless steel. As a result, the cutting edge 23 of the blade 20 is divided into multiple cutting sections 22. It would be understood that the blade may be made from any suitable material.

15

In the embodiment shown, each section 22 of the cutting edge 23 is substantially straight, although it would be understood that the multiple sections may instead curved. Alternatively, the multiple sections of the cutting edge may be a mixture of straight and curved edges.

20

With particular reference to figures 6a and 6b, the cutting edge 23 of the blade 20 is divided into ten sections 22 having an angle α between neighbouring sections. The angle α is between 135° and 155° , ideally at about 144° .

25

As shown in figure 6a, each section 22 defining the cutting edge 23 of the blade 20 extends at an angle γ from a vertex of the blade 20. The angle γ is between 15° and 20° , ideally at about 18° .

30

The blade 20 further comprises a chamfered edge at an angle β from a face of the blade 20. The angle β is between 10° and 20° , ideally at about 15° .

The blade 20 is housed within the housing 12 and is locatable within the front cover plate 18 as shown in figures 7a and 7b. In this way, the blade 20 is substantially obscured from view by a portion of the housing 12 in use.

The guide 24 is locatable under the cast during use, and comprises a recess 26 configured to receive a cutting edge 23 of the blade 20. In the embodiment shown, the recess 26 is in the form of a channel.

- 5 The guide 24 is configured to be insertable between the cast and a surface underneath the cast. The surface may be defined by a patient's skin, a dressing or a bandage.

In use, the guide 24 receives the cutting edge 23 of the rotating blade 20 as the blade 20 cuts and protrudes through the cast, so as to form as a buffer between the blade 20 and the surface
10 underneath the cast.

The guide 24 comprises a forward portion 25a and a rear portion 25b.

The forward portion 25a of the guide 24 is configured to direct the cast towards the blade 20.
15 In the embodiment shown, the forward portion 25a of the guide is tapered to facilitate the directing of the cast towards the blade 20.

The rear portion 25b of the guide 24 is configured to support a portion of the cast during
20 cutting.

The channel 26 in the guide is located at or in association with the cutting area of the cutting
device 10 and is at least partially formed in the rear portion 25b of the guide 24. In the
embodiment shown, the channel 26 is substantially formed in the rear portion 25b of the
guide 24.
25

The guide 24 may fixedly or removably attached to the front cover plate 18. In the
embodiment shown (see for example figure 5, 7a and 7b), the guide 24 is integrally formed
with the front cover plate 18.

30 The cast cutting device 10 further comprises a drive mechanism 28 configured to rotatably
drive the blade 20. In the embodiment shown, the drive mechanism 28 is located within the
housing 12.

The drive mechanism 28 comprises an electric motor 30 and a gearbox 32 coupled to the motor 30. The drive mechanism is configured to rotate the blade 20 at a speed of approximately 25 to 100 rpm.

- 5 The blade 20 is arranged such that it is rotatable by the drive mechanism in a clockwise and anti-clockwise direction.

A chassis 36 is provided within the housing to facilitate the coupling of the top case section 14 and the bottom case section 16 together. In the embodiment shown, the top case and
10 bottom case sections 14, 16 are secured to the chassis 36 by means of fasteners in the form of screws.

The chassis 36 also facilitates the positioning of the blade 20 and the front cover plate 18.

- 15 The chassis 36 comprises a central aperture configured to receive a drive shaft 34 of the gearbox 32. The chassis 36 may be made from any suitable material, for example, the chassis 36 may be made from an ABS plastics material, aluminium etc.

A blade adapter 38 is coupled to the gearbox drive shaft 34 to facilitate the housing and
20 holding of the blade 20 within the housing 12. The blade adapter 38 is made from stainless steel, although it would be understood that the blade adapter 38 may be made from any suitable material.

In the embodiment shown, the blade adapter 38 comprises a cavity at a first end configured to
25 receive the gearbox drive shaft 34 therein and a protrusion 39 at a second end configured to be received in a hole 21 of the blade 20.

A nylon spacer 40 having a cavity 41 therein, is fitted to the second end of the blade adapter
38. The nylon spacer 40 is sized and shaped to be housed within a nylon endplate 42.

30

The nylon endplate 42 is positioned within a recess on an inner side of the front cover plate
18. In use, the blade 20 rotates against an inner surface of the endplate 42.

The nylon spacer together with the nylon endplate 42 act as a basic bearing system that ensures the free running of the gearbox drive shaft 34 and which restricts flexing of the gearbox drive shaft 34 in use.

5 The cast cutting device 10 comprises a user interface 44 in the form of a membrane keypad. In the embodiment shown, the keypad 44 is in the form of a two button configuration comprising a first button 46 (herein after referred to as the "power" button) for switching on and off the device, and a second button 48 (herein after referred to as the "cut" button) for activating the motor 30 to rotate the blade 20.

10

The cut button 48 is also configured to toggle the motor 30 to rotate the blade 20 between a clockwise (forward cutting) direction and an anti-clockwise (reverse releasing) direction.

15 The user interface 44 further comprises a user display configured to indicate to a use the direction of rotation of the blade. In the embodiment shown, the user display comprises a pair of arrows 50, 52 which are each lit by an LED to indicate the direction of rotation of the blade 20.

20 The cast cutting device 10 may be powered by any suitable means. For example, the cast cutting device 10 may be battery operated, for example by means of a built in lithium ion battery, or may be cable powered, for example from a mains power source.

25 A hardwired power cable is shown in the depicted embodiments for powering the device, although it would be understood that the cast cutting device 10 may instead be powered by means of a push-in low voltage dc connector.

Where the cast cutting device 10 is powered via a hardwired power cable 56, a strain relief plate 54 is provided. In the embodiment shown, the strain relief plate 54 is screwed down over the power cable 56 and into the bottom case section 16.

30

The housing 12 defines a handle extending at least substantially orthogonal to the longitudinal axis of the guide 24 and at least substantially parallel to the pivot axis of the blade 24.

The cast cutting device 10 is suitable for cutting any type of cast located on any part of a patient's body. The cast may for example be formed from plaster, a composite material or any other suitable casting material. The cast may for example be located on a patient's arm, leg, torso or any other suitable location.

5

Referring to figure 8, a second embodiment of a blade 120 for use with a cast cutting device 10 in accordance with the invention is shown.

10 The second embodiment is similar to the first embodiment and the reference numerals for similar features of the second embodiment to those of the first embodiment have been increased by 100 for convenience. For example, the cutting edge of the blade which was identified with reference numeral 23 in the first embodiment, is identified with reference numeral 123 in the second embodiment.

15 In the second embodiment, the multiple sections 122 of the cutting edge 123 of the blade 120 is curved rather than straight. In addition, there is a step change between the cutting edges 123 of neighbouring sections 122 so as to define a discontinuous circumferential profile.

20 The cutting edge 123 of the blade 120 as such comprises at least one leading edge configured to engage the cast and move the cast in a direction of rotation of the blade 120.

Referring to figure 9, a third embodiment of a blade 220 for use with a cast cutting device 10 in accordance with the invention is shown.

25 The third embodiment is similar to the second embodiment and the reference numerals for similar features of the third embodiment to those of the second embodiment have been increased by 100 for convenience. For example, the cutting edge of the blade which was identified with reference numeral 123 in the second embodiment, is identified with reference numeral 223 in the third embodiment.

30

As in the second embodiment, the blade 220 comprises a discontinuous circumferential cutting edge 223 profile with a step change between the cutting edges 223 of neighbouring sections 222.

In the third embodiment, rather than the sections 222 comprising a substantially curved profile, the sections 222 comprise a first part 222a that is substantially straight and a second part 222b that is substantially curved with the second part 222b defining the leading edge of each section. It would be understood the ratio of the straight/curved parts of the sections 222 may be different to that depicted in figure 9.

With reference to figures 10 to 12, the use of the cast cutting device 10 in accordance with the invention to cut a cast 60 will now be described.

10 A user first presses the power button 46 to power the cast cutting device 10. When the cast cutting device 10 is on and the blade 20 is not rotating, both LEDs behind the arrows 50, 52 will light up and stay lit.

15 The user then positions the device 10 next to the cast 60 at the point at which the cast 60 is to be cut. The device is mounted at an edge of the cast 60 such that the guide 24 is located on the underside of the cast whilst the blade is arranged relative to the outside of the cast 60. It would be understood that the device may be positioned next to the cast 60 prior to being switched on.

20 Once ready to use, the user proceeds to press the cut button 48. Once pressed the device starts turning the blade clockwise (looking at the device as it is held) and the left LED goes out and the left arrow 50 is no longer illuminated. This signifies that the cast cutting device 10 is now cutting in the forward direction.

25 As the blade 20 rotates and cuts through the cast 60, the guide 24 forms a protective buffer on the underside of the cast 60. The user moves the device 10 along the cast 60 in a desired direction to continue the cutting process as desired.

30 In the event of a snag or stall, the user presses the cut button 48 and the motor 30 changes direction and the rotational direction of the blade 20. The LEDs swap, with the left LED now being lit and the right LED going out so that the right arrow 52 is no longer illuminated and the left arrow is illuminated. As such, the illuminated arrow will always show the direction of travel of the blade 20.

The cut button 48 can be pressed over and over to toggle the change of direction.

Once finished, the user presses the power button 46 and the motor switches off and the blade 20 stops and the LEDs go out.

5

In the event that the blade should become blunt or a different preferred blade configuration is to be used, a user can simply gain access to the blade to replace it by detaching the front cover plate 18 from the housing 12.

10 While the invention has been described with reference to specific embodiments, it would be understood that the invention is not restricted to the details of any foregoing embodiments. The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

15

Claims

1. A cast cutting device comprising:
a housing;
5 a blade for cutting a cast, the blade being supported and rotatable with respect to the housing;
a guide for guiding the cast towards engagement with the blade, the guide being locatable under the cast during use, and comprising a recess configured to receive a cutting edge of the blade.
- 10 2. A cast cutting device comprising:
a housing;
a blade for cutting a cast, the blade being supported and rotatable with respect to the housing;
15 a guide comprising a recess configured to receive a cutting edge of the blade and configured to be insertable between the cast and a surface underneath the cast;
wherein in use, the guide receives the cutting edge of the rotating blade as the blade cuts the cast, so as to form as a buffer between the blade and the surface underneath the cast.
- 20 3. A cast cutting device according to claim 1 or claim 2, the guide comprises a forward portion and a rear portion, wherein the forward portion of the guide is configured to direct the cast towards the blade, and the rear portion of the guide is configured to support a portion of the cast during cutting.
- 25 4. A cast cutting device according to any one of the preceding claims, wherein the recess is a channel.
5. A cast cutting device according to claim 4 when dependent on claim 3, wherein the channel is at least partially formed in the rear portion of the guide.
- 30 6. A cast cutting device according to claim 3 or any claim dependent directly or indirectly on claim 3, wherein the front portion of the guide is tapered.

7. A cast cutting device according to any one of the preceding claims, wherein the housing comprises a front cover plate and the guide is fixedly or removably attached to the front cover plate.
- 5 8. A cast cutting device according to any one of the preceding claims, wherein the cutting edge is divided into multiple sections.
9. A cast cutting device according to claim 8, wherein each of the multiple sections of the cutting edge is substantially straight or curved.
- 10 10. A cast cutting device according to any one of the preceding claims, wherein the cutting edge comprises a discontinuous circumferential profile.
11. A cast cutting device according to claim 10, wherein the cutting edge comprises at least one leading edge configured to engage the cast and move the cast in a direction of rotation of the blade.
- 15 12. A cast cutting device according to any one of the preceding claims, wherein the blade comprises a chamfered edge.
- 20 13. A cast cutting device according to any one of the preceding claims, wherein the blade is rotatable in both a clockwise and an anti-clockwise direction.
14. A cast cutting device according to any one of the preceding claims, further comprising a drive mechanism configured to rotatably drive the blade, optionally the drive mechanism is located within the housing.
- 25 15. A cast cutting device according to claim 14, wherein the drive mechanism is configured to rotate the blade at a speed of approximately 25 to 100 rpm.
- 30 16. A cast cutting device according to claim 13 or any claim directly or indirectly dependent on claim 13, further comprising a user display configured to indicate to a user the direction of rotation of the blade.

17. A cast cutting device according to any one of the preceding claims, wherein the blade is substantially obscured from view by a portion of the housing.

5 18. A cast cutting device according to any one of the preceding claims, wherein the housing defines a handle extending at least substantially orthogonal to the longitudinal axis of the guide and at least substantially parallel to the pivot axis of the blade.

19. A method of cutting a cast using a cast cutting device as claimed in any one of the preceding claims.

10

20. A cast cutting device as generally herein described with reference to and/or substantially illustrated in the accompanying drawings.

15 21. A method of cutting a cast as generally herein described with reference to and/or substantially illustrated in the accompanying drawings.



Application No: GB1418517.7

Examiner: Miss Gabrielle Cowcill

Claims searched: 1-21

Date of search: 16 July 2015

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	1-21	GB 356604 A (ZINKE) Note guard (e) with groove (f), tongue (g), blade (a) and housing (c, d)
X	1-21	KR 10-2011-0019410 A (KIM) See the figures and WPI Abstract, Accession Number: 2011-C55101. Note particularly blade 120, detachable guide 130 and groove 136
X	1-21	US 2344262 A (ODIERNA et al) Note blade 16, guide arm 30 with groove 32 and tapered end 31
X	1-21	CN 203107449 U (ZHAN) See the figures and WPI Abstract, Accession Number: 2013-U23959. Particularly note blade guide 6 and groove
X	1-21	US 2522006 A (WILCOX) Note blade 20, guide 18, groove 19 and tapering of the guide in figure 2
X	1-21	US 1316252 A (MOERING) Note blade 1 with rotation arrow, guide 54 with groove 58 and pointed tip 57

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	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 UKC^X :

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

A61F

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

EPODOC, WPI



International Classification:

Subclass	Subgroup	Valid From
A61F	0015/02	01/01/2006