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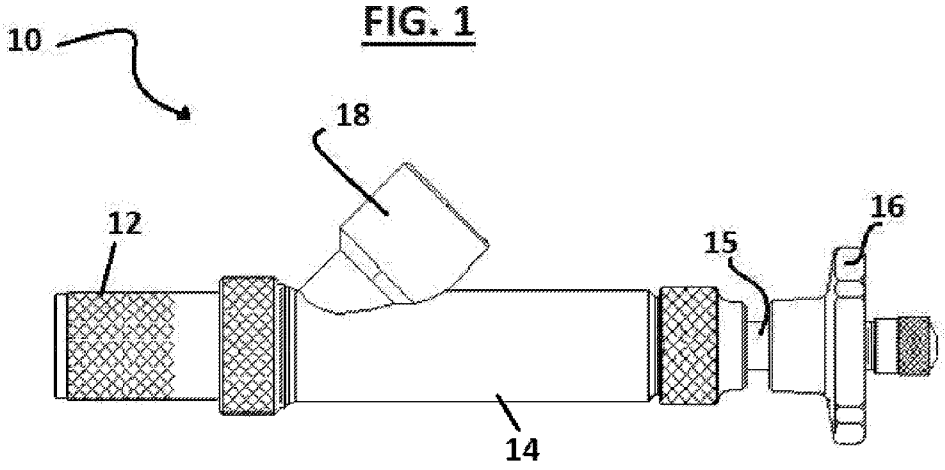
— *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

(54) Title: ATTACHMENT DEVICE

FIG. 1



(57) **Abstract:** An attachment device for applying rotational motion to a tool comprising: a body having a base portion and an end portion spaced from the base portion; the base portion having a recess formed in an undersurface thereof, the recess having a shape complimentary to a handle portion of the tool such that the base portion can be placed over the handle portion of the tool to engage therewith; and the end portion has a central recess formed therein, the central recess being configured to mate with a connector of a power tool to apply rotational motion to the body such that the rotational motion is transferred to the handle portion of the tool.

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ATTACHMENT DEVICE

RELATED APPLICATIONS

The present invention claims priority from Australian Provisional Patent Application No. 2022902356 filed 18 August 2022, the entire contents of which are incorporated herein by reference.

FIELD OF INVENTION

The present invention relates generally to an inflator adaptor for inflating/deflating a body, such as a tyre. In particular, the present invention relates to an attachment device that attaches to an inflator adaptor for use in inflating/deflating heavy vehicle tyres.

BACKGROUND OF THE INVENTION

For heavy vehicles, especially trucks and similar vehicles used in mining applications, servicing of vehicle tyres and the like presents significant challenges, due mainly to the size of tyres. Due to the large volume of pressurised fluid contained within such tyres, the inflation/deflation times can be significant. Further to this, due to the significantly high pressure of fluid present within the tyres, valve cores and other tyre components can quickly become dislodged under pressure and become a dangerous projectile that can cause injury to maintenance workers in the vicinity of the tyre.

For this reason, core removal tools have been developed that function to attach to the valve of the vehicle and safely remove the valve core from the tyre valve for inflation/deflation. Such devices function by attaching to a valve stem of the tyre and rotating an extractor bore to unscrew the valve core which can then be withdrawn from the tyre valve and into the body of the tool such that it is retained within the tool in a position that does not interfere with the inflation/deflation of the tyre. The tool can then be connected to a fluid source, which may be air or a liquid, to inflate the tyre. At the end of the inflation/deflation step, the user of the tool can then reinsert the extractor bore containing the valve core into the tyre valve and rotate the extractor bore to screw the valve core into position.

Whilst such tools have proven effective in significantly minimising the time taken to inflate/deflate such tyres and minimise the likelihood of the valve core becoming released as a dangerous projectile, use of such core removal tools

requires significant effort. The user must screw the extractor bore to remove and refit the valve core, typically under pressure, which places considerable forces on the user's wrists and hands. Such an action requires considerable strength and manual dexterity and is a source of injury for many workers.

Thus, there is a need to provide an attachment device that can be used with such a core extraction tool to improve the use of the device and minimise the manual effort required to use the device.

The above references to and descriptions of prior proposals or products are not intended to be, and are not to be construed as, statements or admissions of common general knowledge in the art. In particular, the above prior art discussion does not relate to what is commonly or well known by the person skilled in the art, but assists in the understanding of the inventive step of the present invention of which the identification of pertinent prior art proposals is but one part.

STATEMENT OF INVENTION

The invention according to one or more aspects is as defined in the independent claims. Some optional and/or preferred features of the invention are defined in the dependent claims.

Accordingly, in one aspect of the invention there is provided attachment device for applying rotational motion to a tool comprising:

a body having a base portion and an end portion spaced from the base portion;

the base portion having a recess formed in an undersurface thereof, the recess having a shape complimentary to a handle portion of the tool such that the base portion can be placed over the handle portion of the tool to engage therewith; and

the end portion has a central recess formed therein, the central recess being configured to mate with a connector of a power tool to apply rotational motion to the body such that the rotational motion is transferred to the handle portion of the tool.

In one embodiment the body has a substantially frustoconical shape with the base portion having a greater diameter than the end portion.

The central recess formed in the end portion may have one or more engagement members formed therein to facilitate engagement with a tool bit of the power tool.

The base portion may have a thickness sufficient to capture the handle portion of the tool therein.

The base portion may have a central recess formed therein to accommodate parts of the tool when the base portion is mounted to the handle portion of the tool.

In another embodiment, the base portion is formed separate to the end portion and the end portion is attached to the base portion to form the body.

The base portion may be detachable from the end portion to facilitate attachment of base portions having different shaped recesses to accommodate a variety of different types of tools.

The base portion may be mounted to the end portion by way of a bolt extending between the base portion and the end portion.

The base portion may be mounted to the end portion via a clutch system.

An end of the base portion may comprise a pawl arrangement centrally mounted thereon. The pawl arrangement may comprise a plurality of pawls mounted radially about a central axis of the base portion, each pawl may comprise a flexible finger member projecting radially outward from the central axis of the base portion.

The end portion may comprise a ratchet assembly mounted about an internal periphery thereof. The end portion may comprise a central cavity located internally of the ratchet assembly, and the ratchet assembly may comprise a plurality of teeth that are uniform in configuration, with each tooth having one edge with a moderate slope and another edge having a steeper slope.

When the base portion is mounted to the end portion, the pawl arrangement of the base portion may be received within the central cavity of the end portion such that the pawls of the pawl arrangement may be received between the teeth of the ratchet assembly.

The tool may be an inflator adaptor tool.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention may be better understood from the following non-limiting description of preferred embodiments, in which:

Fig. 1 is a side view of an inflation adaptor tool for use with the device of

the present invention;

Fig. 2 is a top perspective view of an attachment device in accordance with an embodiment of the present invention;

Fig. 3 is a side view of the attachment device of Fig. 2;

Fig. 4 is a top view of the attachment device of Fig. 2;

Fig. 5 is a bottom perspective view of the attachment device of Fig. 2;

Fig. 6 is a bottom view of the attachment device of Fig. 2;

Fig. 7 is a side view of the attachment device of Fig. 2 in use with the inflation adaptor tool of Fig. 1;

Fig. 8 is an upper perspective exploded view of an alternative embodiment of the attachment device of the present invention;

Fig. 9 is an inverted perspective exploded view of an alternative embodiment of the attachment device of the present invention; and

Fig. 10 is a cross sectional side view of the attachment device of Fig. 8 and Fig. 9.

DETAILED DESCRIPTION OF THE DRAWINGS

Preferred features of the present invention will now be described with particular reference to the accompanying drawings. However, it is to be understood that the features illustrated in and described with reference to the drawings are not to be construed as limiting on the scope of the invention.

The attachment device of the present invention will be described below in relation to its use with an inflator adaptor tool for air or liquid filling of large vehicle tyres. However, it will be appreciated that the attachment device of the present invention could be used with inflator adaptor tools of various types that are employed to remove a valve core of a valve for inflation/deflation purposes.

Referring to Fig. 1, an inflator adaptor tool 10 for use with an attachment device of the present invention is depicted in isolation. The tool 10 comprises a connector portion 12 for connecting to the valve stem of the tyre (not shown) to be inflated/deflated. The connector portion 12 has an open end that screwingly

engages with the valve stem of the tyre and is connected to a main body portion 14. A stem portion 15 (partially obscured) extends within the main body portion 14 and connector portion 12 and is pushed into the valve stem of the tyre to engage the core housing of the valve.

With the end of the stem portion 15 engaged with the core housing of the valve, the stem portion is rotated by the user turning the handle portion 16 in a counter clockwise direction. This causes the core housing of the valve to be unscrewed from the valve. The stem portion 15 can then be withdrawn such that the core housing of the valve is removed from the valve and retained within the main body portion 14 at a position behind a bypass connector 18 where it is held in position during inflation/deflation. The bypass connector 18 can then be attached to a compressed air or fluid supply for delivering the compressed air or fluid into the tyre as required. Following inflation, the stem portion 15 is then pushed into engagement with the valve and rotated in a clockwise direction by the handle portion 16 and fitted to complete the inflation process.

It will be appreciated that act of screwing and unscrewing the stem portion to disengage/engage the core housing with the valve requires significant effort by the user, especially when the tool is being operated in a high pressure environment with forces acting against the tool 10. As such, the act of rotating the handle portion 16 has a significant potential to cause injury to the user, especially after repeated use, where the user may be tired. Furthermore, the reliance on manually screwing the handle portion 16 to engage/disengage the core housing can result in the core housing being loosely fitted which can result in the tyre inadvertently deflating and requiring further inflation. This can be time consuming and have a financial impact by increasing the down-time of the vehicle being out of use. Further, loosely fitting the core housing within the valve can result in the core housing becoming released from the valve under pressure when the tool 10 is removed, which can injure workers in the immediate vicinity of the tyre.

As a result of the above, the attachment device 20, 30 of the present invention has been developed, as shown in Figs. 2 – 7 and Figs 8 - 10.

Referring to Fig. 3, a side view of the attachment device 20 is shown. The attachment device 20 comprises a body 21 having a substantially frustoconical shape. The body 21 has a base portion 22 and an end portion 24, with the base portion 22 and the end portion 24 being connected by a continuous curved wall 23. The base portion 22 is in the form of a disc shape and has thickness ‘W’.

As is shown more clearly in Fig. 2, the end portion 24 is spaced from the base portion 22 by the wall 23 and has an opening 25 formed therein. The opening 25 is centrally located in the end portion 24 and has a square cross-section as depicted more clearly in Fig. 4. The opening 25 extends into the end portion 24 and is configured to mate with a bit of a power tool, such as a drill or impact gun. In this regard, the opening 25 may have engagement members 26 formed therein, such as recesses or depressions to provide an interference fit with a bit of the power tool such that the power tool can impart rotational motion to the body 21, as will be described in more detail below.

Referring to Fig. 5, the underside of the attachment device 20 is depicted. The undersurface of the base portion 22 has a shaped recess 28 formed therein, which is configured to substantially match the shape of the handle portion 16 of the tool 10. A recess 29 is centrally located in the base portion 22 and extends within the body 21 to communicate with the opening 25. In this regard, the recess 29 and the opening 25 combine to form a central recess or path through the body 21 of the device 20. Whilst the recess 28 is depicted as having a flower-shape, or a rounded six-pointed star shape, the shape of the recess 28 will be dependent on the shape of the handle portion 16 of the inflator adaptor tool 10.

The depth of the shaped recess 28 is sufficient such that it can be seated upon the handle portion 16 of the tool 10 in a secure manner. This is achieved in the manner as depicted in Fig. 7, whereby the device 20 is positioned over the end of the handle portion 16 of the tool 10, in the direction of arrows A. The central recess 29 may also accommodate the end cap 19 of the tool 10, or the end cap 19 may be removed prior to use of the device 20.

Once the device 20 is positioned on the handle portion 16, a power tool can then be connected in the opening 25 of the end portion 24 to apply rotational motion to the tool 10 to engage/disengage the bore of the valve, as discussed above in relation to Fig. 1.

An alternative embodiment of the attachment device is depicted in Figs 8 – 10 as reference numeral 30. The attachment device 30 is configured to function in substantially the same manner as attachment device 20, but is formed in multiple parts as will be discussed in more detail below.

The attachment device 30 comprises a main body portion 31 and a separate base member 32 that are attached together by way of a bolt member 33 or the like. The main body portion 31 comprises an end portion 34 having an opening 35 formed therein. The opening 35 is centrally located in the end portion 34 and has

a square cross-section as shown. The opening 35 extends into the end portion 34 and is configured to mate with a bit of a power tool, such as a drill or impact gun. In this regard, the opening 35 may have engagement members 36 formed therein, such as recesses or depressions to provide an interference fit with a bit of the power tool such that the power tool can impart rotational motion to the device 30, in the same manner as discussed above in relation to attachment device 20.

The base member 32 is substantially disc shaped and the underside of the base member 32 is shown in Fig. 9. The underside of the base member 32 has a shaped recess 38 formed therein which is configured to substantially match the shape of the handle portion 16 of the tool 10. A central recess 39 is centrally located in the base member 32 and extends through the body of the base member 32. The central recess 39 communicates with a corresponding recess 40 provided within the main body portion 31 to provide a pass through which the bolt member 33 is received to facilitate attachment of the base member 32 to the main body portion 31, as is shown in Fig. 10. A nut 37 is attached to the threaded end of the bolt member 33 to securely locate the base member 32 with the main body portion 31.

The shaped recess 38 is depicted as having a flower-shape, or a rounded six-pointed star shape. However, the shape of the recess 38 will be dependent on the shape of the handle portion 16 of the inflator adaptor tool 10. As the base member 32 is detachable from the main body portion 31, a variety of different base members having different shaped recesses 38 may be provided to accommodate a variety of different types of tools 10 such that the base member 32 can be simply changed to adapt to a different tool 10.

Referring to Fig. 8, the upside of the base member 32 is shown. The upside of the base member 32 may comprise a pawl arrangement 42 centrally mounted thereon. The pawl arrangement 42 may comprise a plurality of pawls 43 mounted radially about a central axis. In the embodiment as shown there are three pawls 43, although the number and configuration of the pawls 43 may vary. Each pawl 43 comprises a flexible finger member projecting radially outward from a central axis of the base member 32.

As is shown in Fig. 9, the underside of the main body portion 31 comprises a ratchet assembly 45 mounted about the periphery thereof with a central cavity 48 located internally of the peripheral ratchet assembly 45. The ratchet assembly 45 comprises a plurality of teeth 46 that are uniform in configuration, with each tooth 46 having a moderate slope on one edge and a much steeper slope on the

other edge. When the base member 32 is mounted to the end of the main body portion 31, the pawl arrangement 42 is received within the central cavity 48 of the main body portion 31 such that the pawls 43 are received between the teeth 46 of the ratchet assembly 45. This is shown more clearly in Fig.10.

In this regard, the pawl arrangement 42 of the base portion 32 and the ratchet assembly 45 of the main body portion 31 function as a ratchet clutch system. This ensures that rotational motion applied to the main body portion 31 is transferred to the base portion 32 for application to the tool 10 but the amount of torque applied by the device 20 is limited to an acceptable limit to prevent over-tightening of the valve. Thus, upon tightening of the valve, should the desired torque be reached, the ratchet clutch system between the main body portion 31 and the base member 32 will allow for slippage to occur and prevent overtightening. It will be appreciated that the mechanism for forming the clutch system to prevent overtightening of the valves may vary.

It will be appreciated that the device 20, 30 of the present invention can be used to manipulate the stem portion 15 of the tool 10 with a power tool to minimise the amount of manual force required by the user to utilise the tool 10. The use of a rotational power tool also ensures that the core of the valve is correctly disengaged and engaged to avoid any inadvertent release of the core under pressure, which can cause injury to the user, and damage to the tyre.

Throughout the specification and claims the word “comprise” and its derivatives are intended to have an inclusive rather than exclusive meaning unless the contrary is expressly stated or the context requires otherwise. That is, the word “comprise” and its derivatives will be taken to indicate the inclusion of not only the listed components, steps or features that it directly references, but also other components, steps or features not specifically listed, unless the contrary is expressly stated or the context requires otherwise.

It will be appreciated by those skilled in the art that many modifications and variations may be made to the methods of the invention described herein without departing from the spirit and scope of the invention.

The claims defining the invention are as follows:

1. An attachment device for applying rotational motion to a tool comprising:

a body having a base portion and an end portion spaced from the base portion;

the base portion having a recess formed in an undersurface thereof, the recess having a shape complimentary to a handle portion of the tool such that the base portion can be placed over the handle portion of the tool to engage therewith; and

the end portion has a central recess formed therein, the central recess being configured to mate with a connector of a power tool to apply rotational motion to the body such that the rotational motion is transferred to the handle portion of the tool.

2. An attachment device according to claim 1, wherein the body has a substantially frustoconical shape with the base portion having a greater diameter than the end portion.

3. An attachment device according to claim 1, wherein the central recess formed in the end portion has one or more engagement members formed therein to facilitate engagement with a tool bit of the power tool.

4. An attachment device according to claim 1, wherein the base portion has a thickness sufficient to capture the handle portion of the tool therein.

5. An attachment device according to claim 1, wherein the base portion has a central recess formed therein to accommodate parts of the tool when the base portion is mounted to the handle portion of the tool.

6. An attachment device according to claim 1, wherein the base portion is formed separate to the end portion and the end portion is attached to the base portion to form the body.

7. An attachment device according to claim 6, wherein the base portion is detachable from the end portion to facilitate attachment of base portions having different shaped recesses to accommodate a variety of different types of tools.

8. An attachment device according to claim 6, wherein the base portion is mounted to the end portion by way of a bolt extending between the base portion and the end portion.

9. An attachment device according to claim 6, wherein the base portion is mounted to the end portion via a clutch system.

10. An attachment device according to claim 9, wherein an end of the base portion comprises a pawl arrangement centrally mounted thereon.

11. An attachment device according to claim 10, wherein the pawl arrangement comprises a plurality of pawls mounted radially about a central axis of the base portion, each pawl comprising a flexible finger member projecting radially outward from the central axis of the base portion.

12. An attachment device according to any one of claims 9 – 11, wherein the end portion comprises a ratchet assembly mounted about an internal periphery thereof.

13. An attachment device according to claim 12, wherein the end portion comprises a central cavity located internally of the ratchet assembly, and the ratchet assembly comprises a plurality of teeth that are uniform in configuration, with each tooth having one edge with a moderate slope and another edge having a steeper slope.

14. An attachment device according to claim 13, wherein when the base portion is mounted to the end portion, the pawl arrangement of the base portion is received within the central cavity of the end portion such that the pawls of the pawl arrangement are received between the teeth of the ratchet assembly.

15. An attachment device according to any one of the preceding claims, wherein the tool is an inflator adaptor tool.

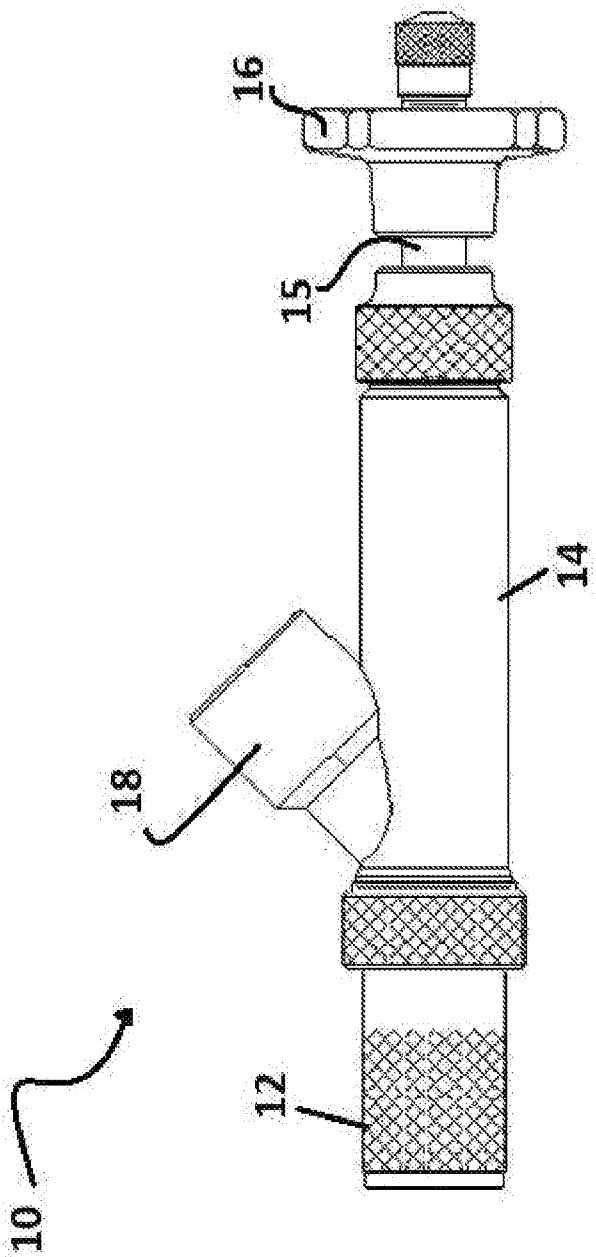

FIG. 1

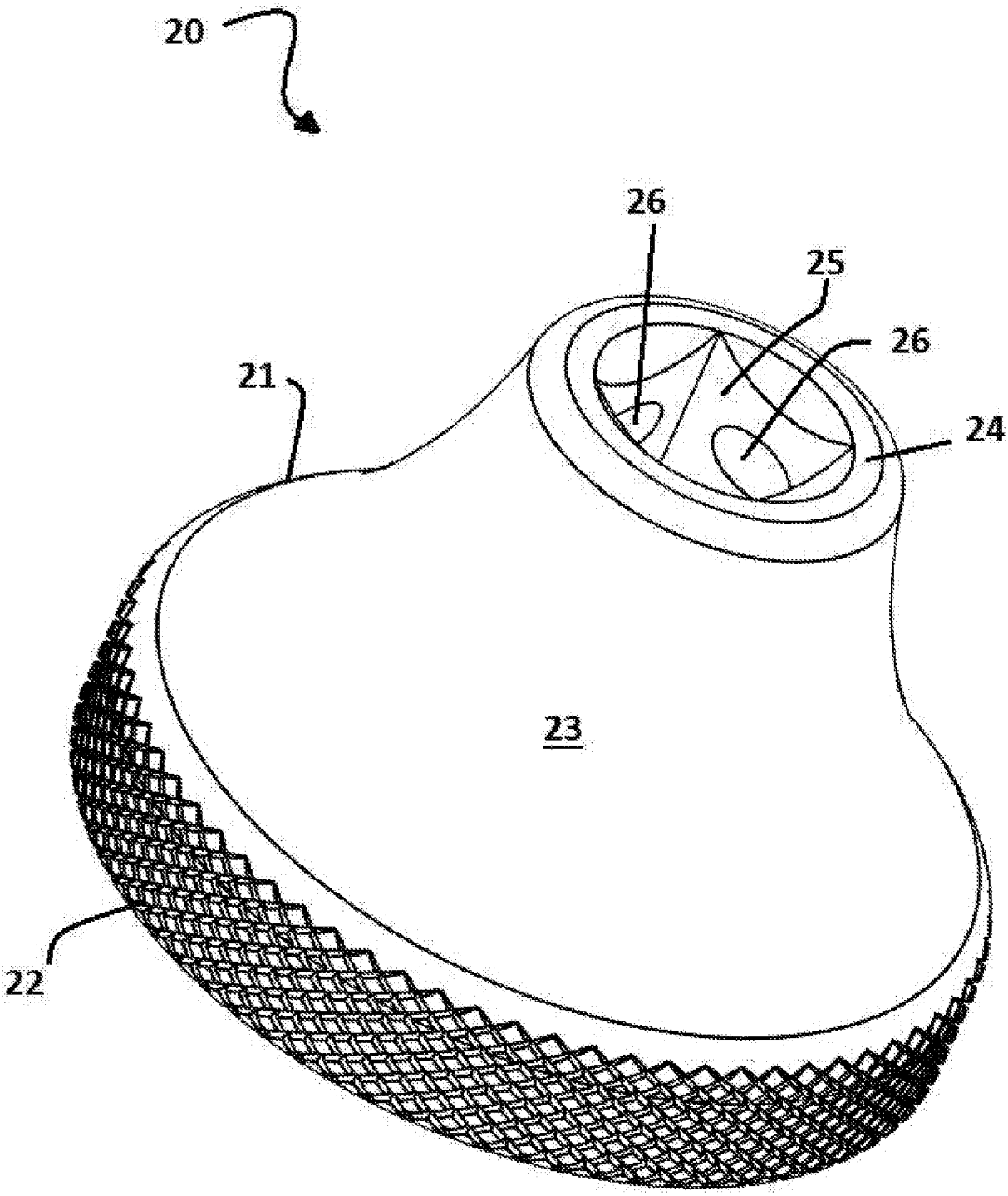

FIG. 2

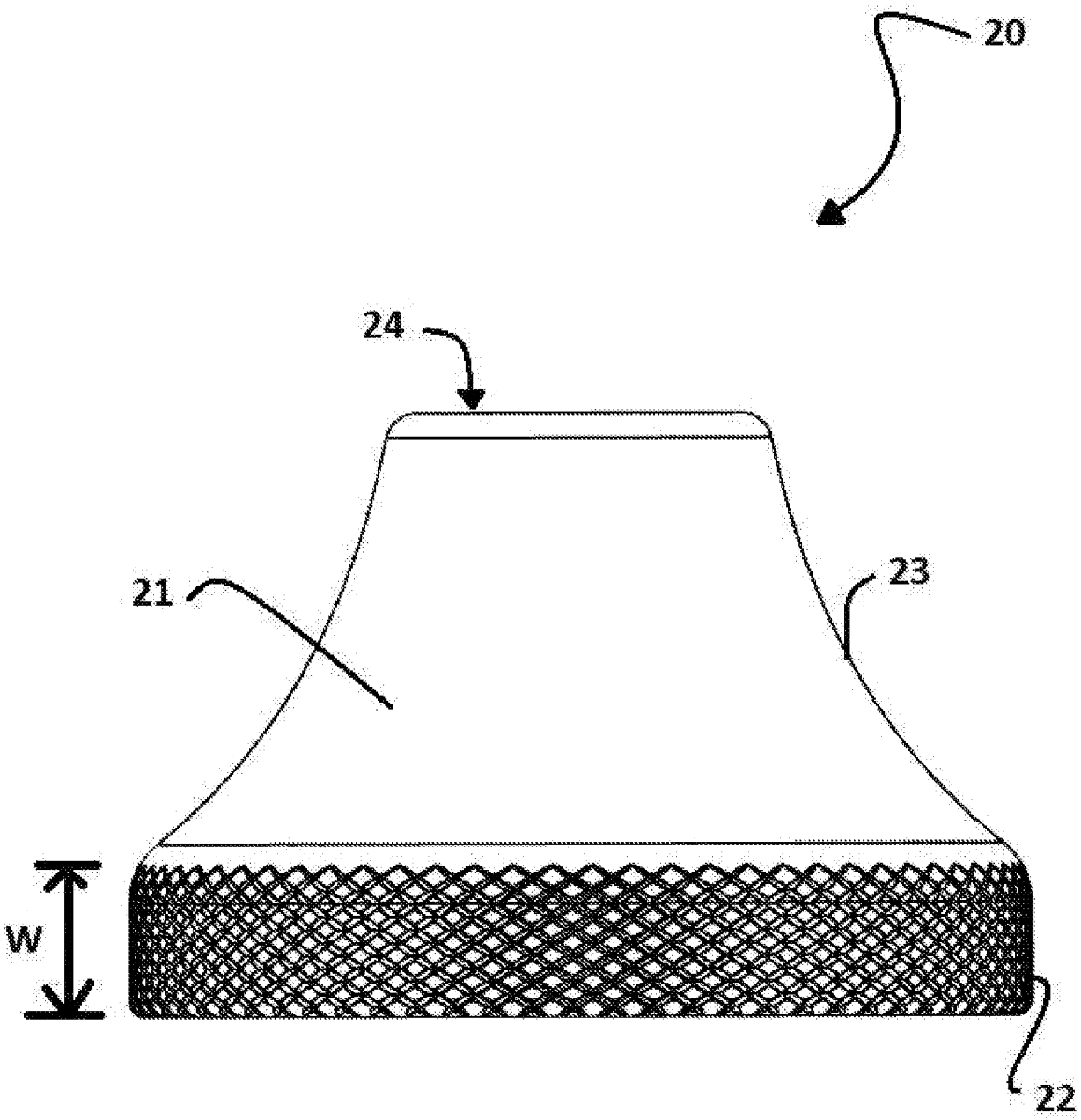

FIG. 3

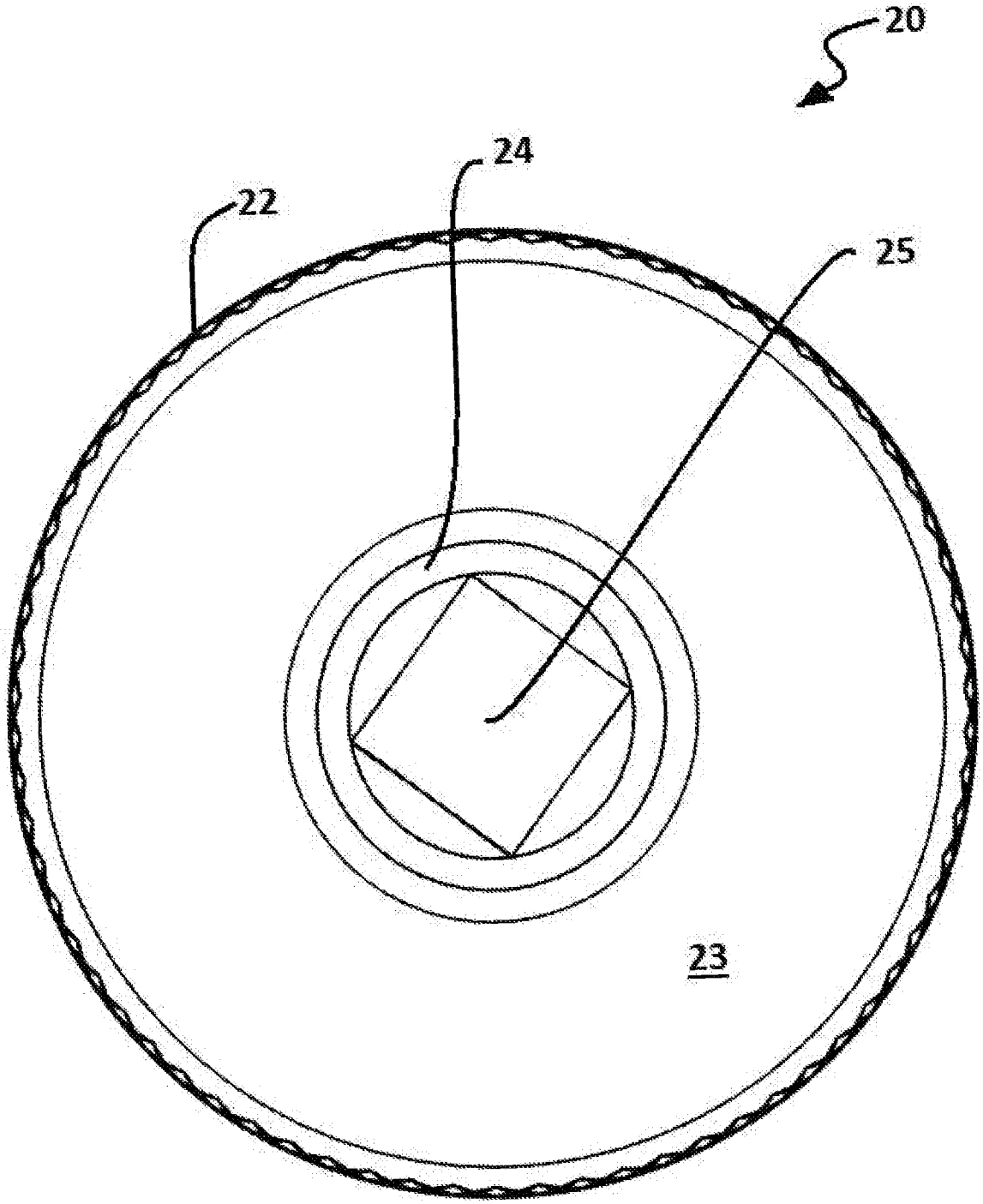

FIG. 4

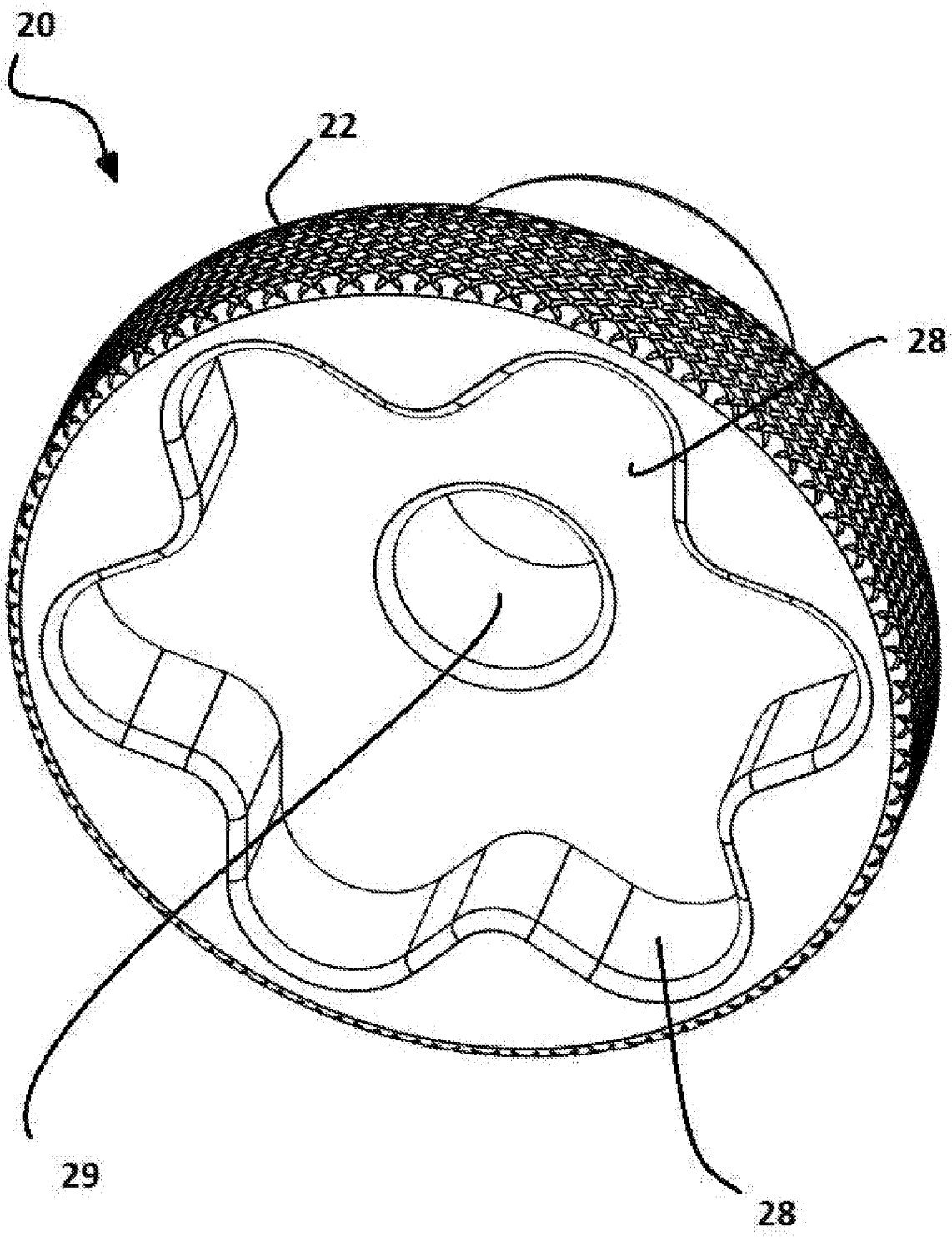

FIG. 5

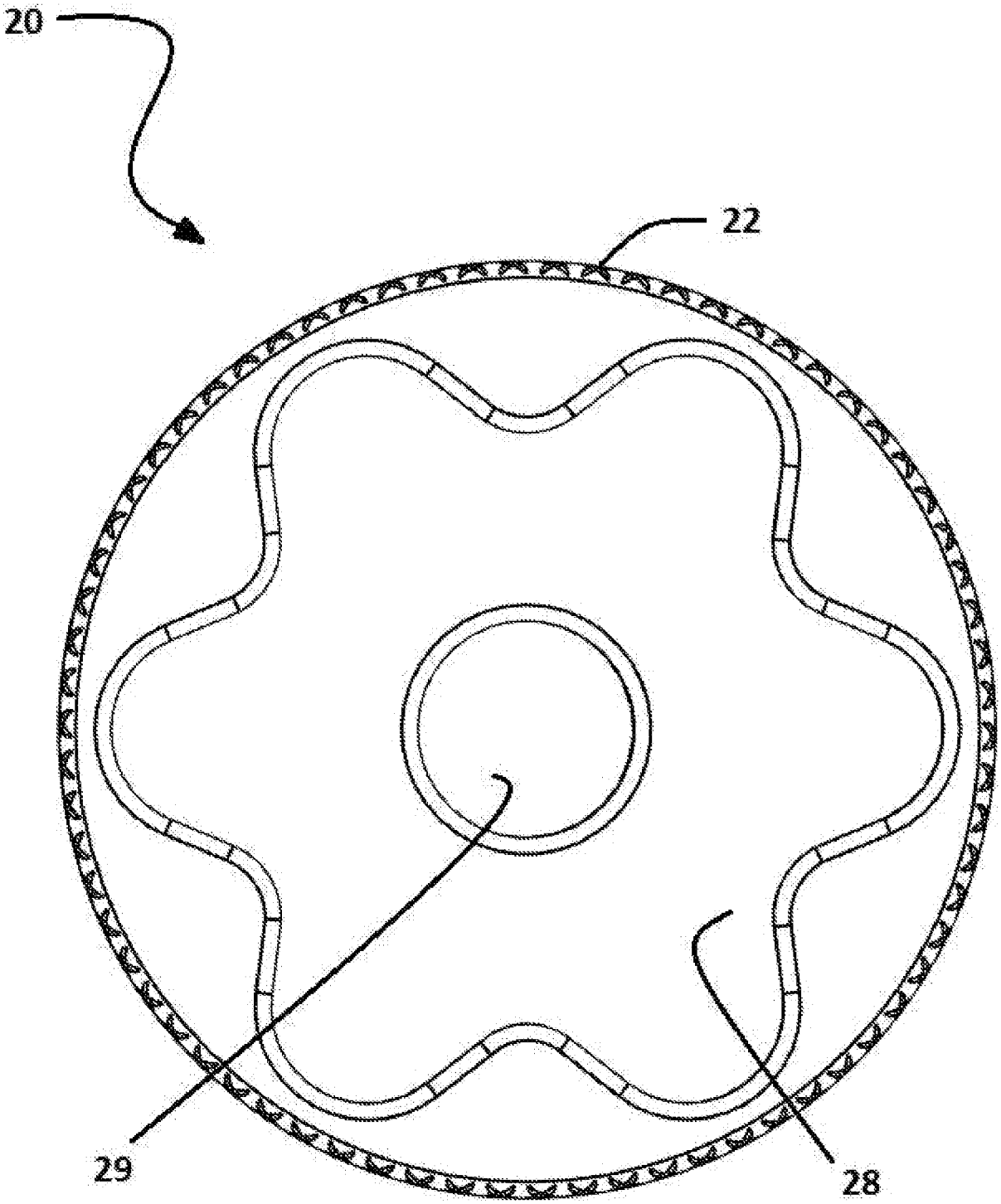

FIG. 6

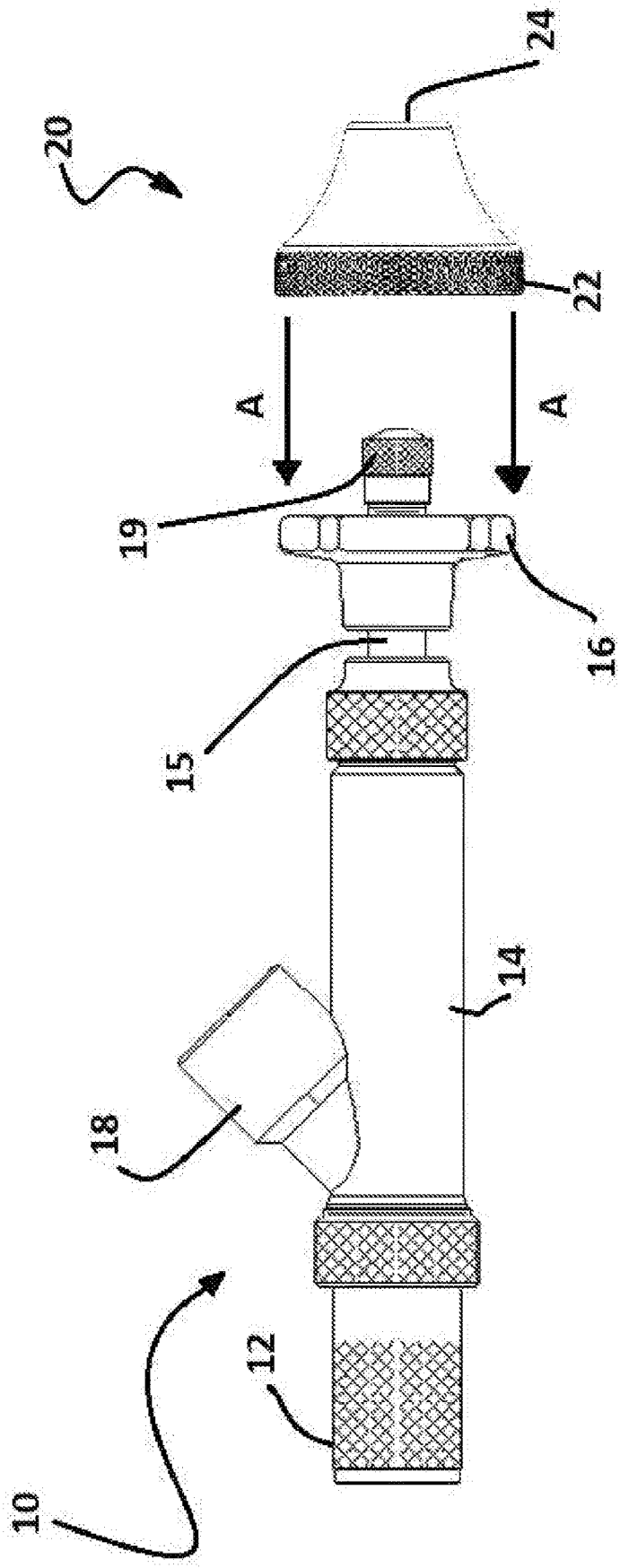

FIG. 7

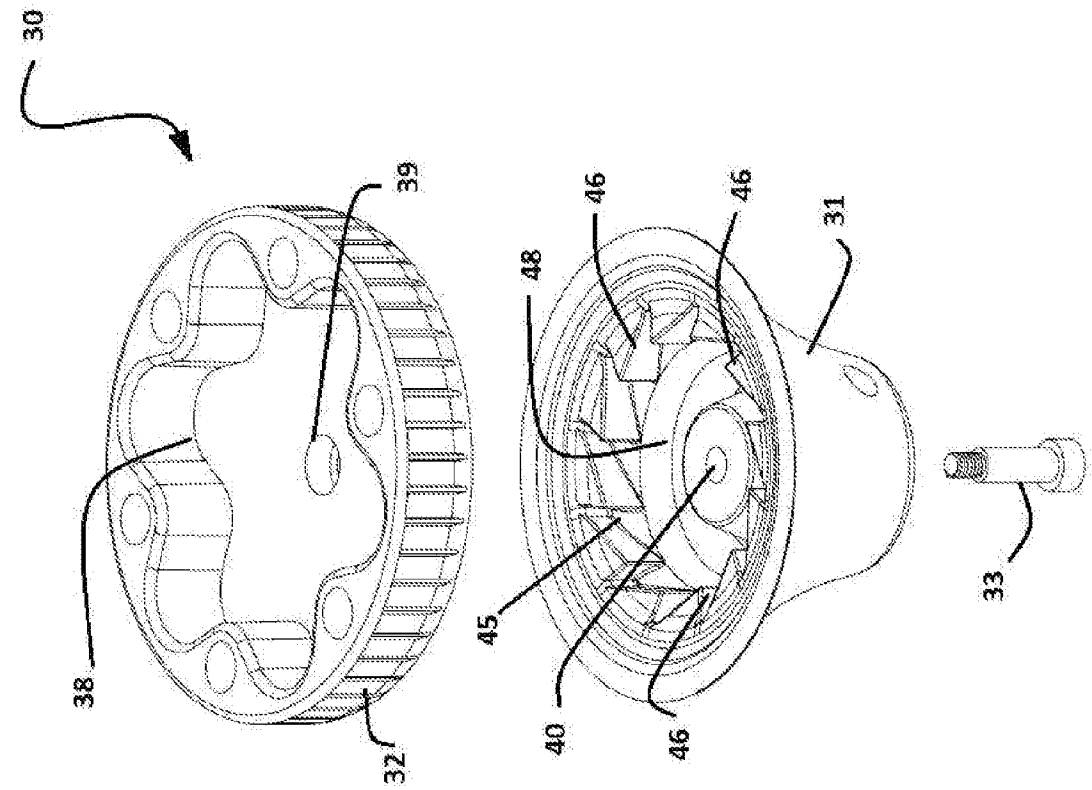

FIG. 9

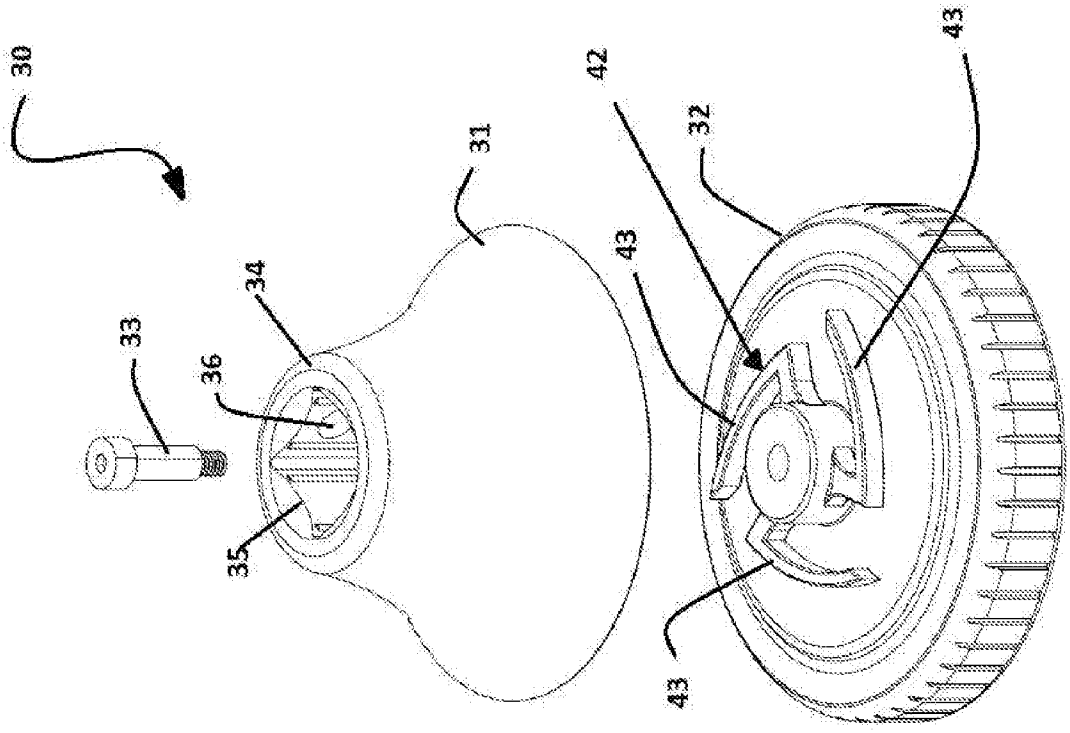

FIG. 8

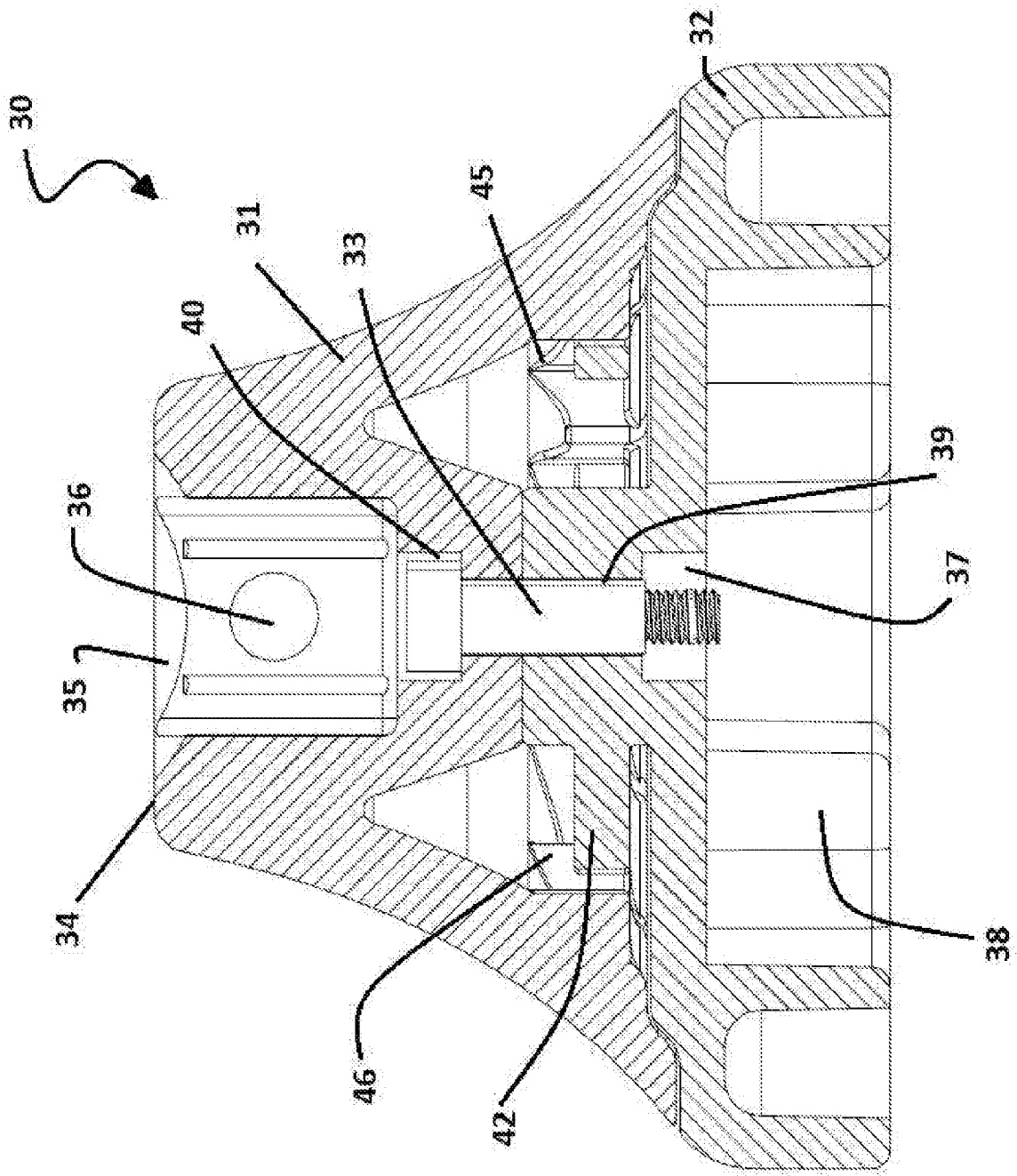

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2023/050785

A. CLASSIFICATION OF SUBJECT MATTER

B25B 27/00 (2006.01) B25B 21/00 (2006.01) B60C 29/06 (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: IPC: CPC: B25B27/0057,B60C29/06, B25B21/007,B25B21/002, B60C25/18, B60C29/066 and keywords: TYRE, TIRE, DRILLING, UNSCREW, VALVE, HANDLE, ATTACHMENT, BIT, ADAPTOR, and other like terms.

Google Keywords or phrases: drill bit open bottle lid; jar lid opener using drilling machine; super large bore, Z-bore inflator handle, machine drilling machine, chuck adapter, bit.

Esapcenet AusPAT search for BARRY, Nigel as the applicant.

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:

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"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

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Date of the actual completion of the international search	Date of mailing of the international search report
28 November 2023	28 November 2023

Name and mailing address of the ISA/AU

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INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/AU2023/050785**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2019/0152007 A1 (MONROY) 23 May 2019 Figures	1 - 15
X	US 2020/0361068 A1 (KONING) 19 November 2020 Figures	1 - 15
X	US 2015/0114673 A1 (DE CARUFEL) 30 April 2015 Figures	1 - 15
X	CN 109551413 A (TAIZHOU CHUANGMAO POWER TOOLS CO LTD) 02 April 2019 Figures	1 - 15
X	US 2019/0247984 A1 (MILWAUKEE ELECTRIC TOOL CORP) 15 August 2019 Figures	1 - 15

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2023/050785**

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 2019/0152007 A1	23 May 2019	US 2019152007 A1	23 May 2019
US 2020/0361068 A1	19 November 2020	US 2020361068 A1	19 Nov 2020
		US 11014223 B2	25 May 2021
		WO 2020236372 A1	26 Nov 2020
US 2015/0114673 A1	30 April 2015	US 2015114673 A1	30 Apr 2015
		US 9902409 B2	27 Feb 2018
		CA 2865690 A1	30 Apr 2015
CN 109551413 A	02 April 2019	CN 109551413 A	02 Apr 2019
US 2019/0247984 A1	15 August 2019	US 2019247984 A1	15 Aug 2019
		US 11161226 B2	02 Nov 2021
		CN 111936271 A	13 Nov 2020
		CN 111936271 B	13 May 2022
		CN 114770417 A	22 Jul 2022
		US 2022024004 A1	27 Jan 2022
		US 11759925 B2	19 Sep 2023
		WO 2019160868 A1	22 Aug 2019

End of Annex

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