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TOOL FOR DISASSEMBLING COMPONENTS OF A RESPIRATORY THERAPY SYSTEM

1. BACKGROUND TO THE TECHNOLOGY

1.1. FIELD OF THE TECHNOLOGY

[001] The present invention relates to tools for use with medical devices, apparatus and/or systems, in particular medical devices, apparatus and/or systems for the monitoring, treatment, prevention and/or amelioration of respiratory-related disorders.

1.2. DESCRIPTION OF THE RELATED ART

[002] A range of respiratory disorders exist. Certain disorders may be characterised by particular events, e.g. apneas, hypopneas, and hyperpneas.

[003] Various respiratory therapies, such as Continuous Positive Airway Pressure (CPAP) therapy, Non-invasive ventilation (NIV), Invasive ventilation (IV), and High Flow Therapy (HFT) have been used to treat one or more of the above respiratory disorders.

[004] These respiratory therapies may be provided by a respiratory therapy system. Such systems may also be used to screen, diagnose, or monitor a condition without treating it.

[005] A respiratory therapy system may comprise a plurality of devices including a Respiratory Pressure Therapy Device (RPT device), an air circuit, a humidifier, a patient interface, an oxygen source, and data management. Many of these devices comprise a plurality of interconnected components, and the devices themselves are interconnected.

[006] Proper use of such respiratory therapy systems requires regular cleaning and maintenance. For example, humidifier reservoirs may need to be removed from the body of a humidifier device and thereafter opened for cleaning. It may also be necessary to remove the cushion module from a patient interface, for example to replace the cushion module at the end of its useful life or to change the size of the cushion module to better fit the patient.

[007] This maintenance may require disassembly of clip-fit or friction-fit components. However, many users of such respiratory therapy systems may have reduced dexterity and/or relatively low hand or grip strength and may find disassembly of the apparatus difficult and/or painful. This may lead to impaired clinical outcomes if maintenance is done less frequently than is optimal and/or ill-fitting components are not replaced to provide the correct fit.

2. OBJECT OF THE TECHNOLOGY

[008] It is an object of the technology to provide a hand tool for use in disassembling components of a respiratory therapy system which will make such disassembly easier.

[009] Alternatively, it is an object of the technology to at least provide the public with a useful choice.

3. SUMMARY OF THE TECHNOLOGY

[010] According to one aspect of the technology there is provided a hand tool for use in disassembling components of a respiratory therapy system, the tool comprising an elongate handle portion, a tip portion provided to a first end of the handle portion and a forked portion provided to a second end of the handle portion, wherein the tip portion comprises a tapered wedge portion.

[011] In examples:

- a. the forked portion comprises a pair of spaced apart legs, wherein an inner surface of each leg comprises an engagement formation configured to engage a predetermined component of a respiratory therapy system;
- b. each engagement formation comprises a concave engagement surface;
- c. each engagement formation comprises a plurality of substantially parallel channels;
- d. each channel is open at a first end thereof;
- e. each channel is substantially transverse to a longitudinal axis of the hand tool;
- f. the predetermined component is a connector of a CPAP tube;
- g. the channels are configured to engage ribs provided to the CPAP tube connector;
- h. each fork leg curves out of plane with the handle portion;
- i. the engagement formation comprises a rib which is substantially aligned with the leg of the forked portion;
- j. each leg further comprises a flange portion configured to operate, in use, as a cam surface or fulcrum portion;
- k. a flange portion is provided on opposite sides of each leg;

- l. a plurality of ribs or fins are provided to outer lateral surfaces of the handle portion;
- m. the ribs or fins are arranged substantially transversely to a longitudinal axis of the tool;
- n. the handle portion comprises two spaced apart handle members;
- o. the handle members taper outwardly between the forked portion and the tip portion;
- p. the tip portion comprises a tapered wedge portion;
- q. the tip portion is provided with one or more protruding abutment portions;
- r. each abutment portion comprises an abutment surface which extends across the entire width of the wedge portion; and/or
- s. the abutment surface comprises a surface of a portion of increased thickness of the tip.

[012] Further aspects of the technology, which should be considered in all its novel aspects, will become apparent to those skilled in the art upon reading of the following description which provides at least one example of a practical application of the technology.

4. BRIEF DESCRIPTION OF THE DRAWINGS

[013] One or more embodiments of the technology will be described below by way of example only, and without intending to be limiting, with reference to the following drawings, in which:

- Fig. 1 is a perspective view of a hand tool for disassembling components of a respiratory therapy system according to one form of the technology.
- Fig. 2A is a perspective view of a tip portion of the hand tool shown in Fig. 1.
- Fig. 2B is an enlarged side view of the tip portion of the hand tool of Fig. 1.
- Fig. 2C is an enlarged top view of the forked portion of the hand tool of Fig. 1.
- Fig 2D is an enlarged side view of the forked portion of the hand tool of Fig. 1.

- Fig. 3 is a diagrammatic perspective view of a hand tool of one form of the technology being used to separate a humidifier reservoir from the body of a humidifier device.
- Fig. 4 is a diagrammatic end view of a hand tool of one form of the technology being used to open a latch of a humidifier reservoir.
- Figs. 5A – 5C are diagrammatic side views showing a hand tool of one form of the technology being used to separate an air tube from a device.
- Fig. 6 is a diagrammatic perspective view of a hand tool of one form of the technology being used to separate a conduit from a cushion module of a patient interface.
- Fig. 7 is a perspective view of a hand tool of one form of the technology being used to separate a cushion module of a patient interface from the frame of the patient interface.
- Fig. 8 is a perspective view of a hand tool for disassembling components of a respiratory therapy system according to another form of the technology.
- Fig. 8A is an enlarged view of a leg of the forked portion of the hand tool of Fig. 8.
- Fig. 9 is a perspective view of an air circuit connector connected to an RPT device.

5. BRIEF DESCRIPTION OF EXEMPLARY FORMS OF THE TECHNOLOGY

[014] Referring first to Figs. 1 and 2A-2D, a hand tool according to one form of the technology is generally referenced by arrow 100. The hand tool 100 is configured to be of use in disassembling one or more components of a respiratory therapy device.

[015] In one form of the technology the tool 100 comprises an elongate handle portion 110. A tip portion 120 is provided to a first end of the handle portion 110 and a forked portion 130 is provided to the opposite end of the handle portion 110.

[016] The tip portion 120 is configured to assist with prying or prising apart two components. The tip portion 120 comprises a tapered wedge portion 140. The distal end 150 of the wedge portion 140 may be relatively thin, for example having a thickness T1 around 1.5 mm-1.7mm, to allow the wedge portion 140 to be inserted in a gap between two components. The wedge portion 140 may taper outwardly from the distal end 150. For example, the wedge portion 140 may have a length L1 of approximately 8-9 mm long and may taper outwardly to a thickness T2 of around

12 mm. The width of the wedge portion 140 may also increase from the distal end 150. The distal end 150 may be curved.

[017] The tip portion 120 may be provided with one or more protruding abutment portions 160 configured to limit the length of the tip portion 120 which can be inserted into a gap.

[018] In the example shown the tip portion 120 has an outer wall 170 defining the wedge portion 140 and the abutment portions 160. The outer wall 170 may surround a rebated inner portion 180 which is significantly thinner. As well as defining the wedge and stopper formations 140, 160, the outer wall 170 may increase the strength and stiffness of the tip portion 120. In alternative forms of the technology the tool 100 may not comprise a rebated portion 180, that is, the inner part of the tip portion 120 may be the same thickness as the outer wall 170 such that the inner wall is not separately defined. In one example a portion of the tool, e.g. the rebated portion 180, may comprises a Quick Response (QR) code which may, for example, link to a website with instructions for using the tool.

[019] In one form of the technology the handle portion 110 may comprise a plurality of ribs or fins 190. The ribs 190 may extend substantially longitudinally along the handle portion 110. The ribs 190 may make the handle portion 110 easier to grip, particularly when used in a twisting motion, as described further below. The handle portion 110 may comprise one or more narrowed or necked portions 200 adjacent the tip 120 to make the handle easier to grip when inserting the tip portion 120 into a gap. In one example the handle portion 110 is around 80-90 mm long and the overall length of the tool 100 is around 200-220 mm, e.g. 211 mm. In one example the handle portion 110 makes up around 40-50% of the length of the tool.

[020] The forked portion 130 may have two legs 210. In examples, each leg 210 is provided with a flange portion 220. Each flange portion 220 may comprise a curved edge 230 extending from the base 240 of the leg 210. The flange portion 220 may also comprise a substantially straight edge 250 extending from a point adjacent an end 260 of the leg 210, e.g. at an angle of around 36 degrees from a longitudinal axis L of the leg. The straight edge 250 may meet the curved edge 230 at a point around one third of the length of the leg 210 from the base 240 of the leg 210. The height of each flange portion 220 (measured transverse to the longitudinal axis of the leg 210) may be around 26 mm. The flange portions 220 may be around 1.5 – 2 mm thick. The distance D1 between the centres of the flange portions 220 may be around 39 mm.

[021] The flange portions 220 may operate as a cam surface and/or a fulcrum, as is described further below. In examples, a flange portion 220 is provided on each side of each leg 210. The flange portions 220 may be arranged parallel to each other.

[022] An inner surface 212 of each leg 210 may comprise an engagement formation 214 configured to engage a predetermined component of a respiratory therapy system. In some examples the engagement formation 214 comprises a rib 270 extending inwardly from the flange portion 220. The distance between the ribs 270 may taper inwardly from an initial distance D2 (at the opening of the fork) of around 26.3 mm to reduced distance D3 of around 24.3mm, e.g., around a 2mm reduction in width. In one example the overall width D4 of the fork portion 130 may be around 51 mm.

[023] Referring next to Fig. 3, a tool 100 of the present technology is shown in use assisting in separating a humidifier reservoir 300 from the housing 310 of a humidifier device (e.g. the humidifier integrated into ResMed's AirSense S11™ CPAP machine). As shown, the tip 120 of the tool 100 may be inserted into the gap between the reservoir 300 and the housing 310. The tool 100 can then be used to lever the reservoir 300 away from the housing 310.

[024] The abutment portions 160 (if provided) may prevent the user from accidentally inserting the tip 120 too far and damaging the humidifier.

[025] Referring next to Fig. 4, a tool 100 of the present technology is shown in use assisting in unlatching the lid 320 of a humidifier reservoir 300 (e.g ResMed's HumidAir 11™ standard water tub). As shown, the tip 120 of the tool 100 may be inserted between the latch 330 and the body 340 of the reservoir 300. The tool 100 may then be rotated to disengage the latch 330 and allow the lid 320 to be removed.

[026] Referring next to Figs 5A-5C a tool 100 of the present technology is shown in use assisting in removing an air circuit 350 (e.g. a conduit such as ResMed's ClimateLineAir™ CPAP tubing) from a Respiratory Pressure Therapy Device (RPT device) 360 (for example ResMed's AirSense S11™ CPAP machine).

[027] As shown in Fig. 5A, the forked portion 130 of the tool 100 is moved over the connector or cuff 370 of the air circuit 350, such that the cuff 370 is gripped by the fork legs 210. As shown in Figs. 5B and 5C, the tool 100 is then rotated to lever the cuff 370 away from the body of the device 360. In one example the tool 100 may be rotated using the ends 260 of the fork legs 210 as a fulcrum. In another example the tool 100 may be rotated using the flange portions 220 (if provided) as a fulcrum.

[028] Referring next to Fig. 6, a tool 100 of the present technology is shown in use assisting in separating a conduit 380 (e.g. a component of a conduit headgear) of a patient interface (e.g. ResMed's F30i™) from a cushion module 390 of the interface. As shown in the drawing, the tip 120 of the tool 100 may be inserted into the space between the cushion module 390 and the conduit 380, and the tool 100 rotated to separate the parts.

[029] Referring next to Fig. 7, a tool 100 of the present technology is shown in use assisting in separating a cushion module 390 of a patient interface (e.g. ResMed's N20™ or F20™) from a frame 400 of the patient interface. As shown in the figure, the tip 120 of the tool 100 may be inserted into the space between the cushion module 390 and the frame 400, and the tool 100 rotated to separate the parts.

[030] In examples the tool 100 is formed in a single piece. In one form of the technology the tool 100 is formed from plastic as a single injection moulded part.

[031] Referring next to Figs. 8 and 8A, a hand tool 100 according to another form of the technology is shown. As with the example shown in Figs. 1 and 2, the hand tool 100 comprises an elongate handle portion 110, with a tip portion 120 provided to a first end of the handle portion 110 and a forked portion 130 provided to the opposite end of the handle portion 110.

[032] The tip portion 120 comprises a tapered wedge portion 140. The distal end 150 of the wedge portion 140 may be relatively thin, for example having a thickness around 1.5 mm-1.7mm, to allow the wedge portion 140 to be inserted in a gap between two components. The wedge portion 140 may taper outwardly from the distal end 150. For example, the wedge portion 140 may have a length of approximately 8-9 mm long and may taper outwardly to a thickness of around 12 mm. The width of the wedge portion 140 may also increase from the distal end 150. The distal end 150 may be curved.

[033] The tip portion 120 may be provided with one or more protruding abutment portions 160 configured to limit the length of the tip portion 120 which can be inserted into a gap. In the example shown in Fig. 8, the abutment portions 160 comprise an abutment surface 162 which extends across the entire width of the wedge portion 140. In examples, abutment surfaces 162 are provided to both sides of the wedge portion 140. Each abutment surface 162 may be substantially parallel with the distal end 150 of the wedge portion 140. In examples, the abutment surface 162 comprises a surface of a portion of increased thickness 164 of the tip. The portion of increased thickness 164 may extend from the abutment surface 162 to the handle portion 110.

[034] The tip portion 120 of the examples shown in Fig. 8 may be used in the same way as the example shown in the previous figures.

[035] The handle portion 110 may comprise a plurality of ribs or fins 190. In the examples shown in Fig. 8, the ribs 190 may extend substantially transversely to the longitudinal axis L-L of the handle portion 110.

[036] The handle portion 110 may comprise two spaced apart handle members 112 connecting the tip portion 120 and the forked portion 130. In examples, no material is provided in the space between the spaced apart handle members 112, in order to minimize the weight of the tool 100. In examples, the ribs or fins 190 may be provided to outer lateral surfaces 114 of the handle members 112.

[037] In one example the handle portion 110 makes up around 40-60% of the length of the tool 100.

[038] The forked portion 130 may have two spaced apart legs 210. An inner surface 212 of each leg 210 may comprise an engagement formation 214 configured to engage a predetermined component of a respiratory therapy system. Each engagement formation 214 may protrude inwardly from an inner surface 212 of the corresponding leg 210 of the forked portion 130.

[039] In the example shown in Figs. 8 and 8A, the engagement formation 214 is configured to engage an air circuit connector 370, for example, a connector 372 of ResMed's Climateline (TM) CPAP tube (see Fig. 9). In the example shown, the engagement formation 214 comprises a plurality of substantially parallel channels 216. The channels 216 are orientated substantially transverse to a longitudinal axis L-L of the tool 100 (e.g. transverse to the handle members 112). Each channel 216 is open at a first end 218 thereof, as best seen in Fig. 8A.

[040] The channels 216 are configured to engage corresponding ribs 374 provided to the CPAP tube connector 372 (shown in Fig. 9). In examples, the engagement formation 214 may also comprise a concave engagement surface 219 which is configured to engage a convex surface 376 provided to each side of the connector 372. Typically, the opposed engagement formations 214 work together to engage the connector 372.

[041] With the engagement formations 214 engaged with the connector 372, a patient can remove the tube connector 372 from a Respiratory Pressure Therapy Device (RPT device) 360 (for example ResMed's AirSense S11™ CPAP machine), by pulling the handle portion 110 directly away from the RPT device 360. In examples, the handle members 112 may taper outwardly from the forked portion 130 to the tip portion 120 (e.g. the outer surfaces of the handle

members 112 taper outwardly and optionally a spacing between the handle members 112 increases between the forked portion 130 and the tip portion 120) in order to assist the patient in gripping the handle portion 110 during this action. In this example, the forked portion 130 is not used to lever the connector 370, 372 from the RPT device 360, that is, no part of the forked portion 130 is used as a fulcrum. Instead, the patient simply exerts a force substantially in line with the longitudinal axis L-L of the tool 100 (or of the handle members 112). The relatively large handle portion 110, along with the ribs 190 and/or tapered configuration of the handle members 112, make it much easier for a patient, particularly a patient who has reduced dexterity and/or relatively low hand or grip strength, to remove the connector 370, 372 from the RPT device 360.

[042] In the example shown in Figs. 8 and 8A, the legs 210 of the forked portion 130 curve out of plane with the handle portion 110. This may assist the patient in correctly orientating the tool 100 such that the engagement formations 214 can be engaged with the connector 370 (e.g. ensuring the patient is not holding the tool 100 upside down).

[043] In other examples, the engagement formation 214 may be configured to engage other components and/or other configurations of tube connector 370. For example, in one example the engagement formation 214 may be provided with a plurality of parallel raised ribs (not shown) which are configured to engage channels or grooves provided to a tube connector, for example the connector of Fisher and Paykel Healthcare's ThermoSmart (TM) heated tubing.

[044] As with the previous example, the tool 100 of Figs. 8 and 8A may be formed in a single piece, e.g. from plastic as a single injection moulded part.

[045] Those skilled in the art will appreciate that examples of the technology may make disassembly of various CPAP device components much easier and may therefore result in patients (particularly those with reduced dexterity and/or hand strength) maintaining their equipment more regularly and/or ensuring that patients make the effort to replace ill fitting components with ones which fit better.

5.1. Other Remarks

[046] Unless the context clearly dictates otherwise and where a range of values is provided, it is understood that each intervening value, to the tenth of the unit of the lower limit, between the upper and lower limit of that range, and any other stated or intervening value in that stated range is encompassed within the technology. The upper and lower limits of these intervening ranges, which may be independently included in the intervening ranges, are also encompassed within the

technology, subject to any specifically excluded limit in the stated range. Where the stated range includes one or both of the limits, ranges excluding either or both of those included limits are also included in the technology.

[047] Furthermore, where a value or values are stated herein as being implemented as part of the technology, it is understood that such values may be approximated, unless otherwise stated, and such values may be utilized to any suitable significant digit to the extent that a practical technical implementation may permit or require it.

[048] Furthermore, “approximately”, “substantially”, “about”, or any similar term used herein means +/- 5-10% of the recited value.

[049] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this technology belongs. Although any methods and materials similar or equivalent to those described herein can also be used in the practice or testing of the present technology, a limited number of the exemplary methods and materials are described herein.

[050] When a particular material is identified as being used to construct a component, obvious alternative materials with similar properties may be used as a substitute. Furthermore, unless specified to the contrary, any and all components herein described are understood to be capable of being manufactured and, as such, may be manufactured together or separately.

[051] It must be noted that as used herein and in the appended claims, the singular forms "a", "an", and "the" include their plural equivalents, unless the context clearly dictates otherwise.

[052] All publications mentioned herein are incorporated herein by reference in their entirety to disclose and describe the methods and/or materials which are the subject of those publications. The publications discussed herein are provided solely for their disclosure prior to the filing date of the present application. Nothing herein is to be construed as an admission that the present technology is not entitled to antedate such publication by virtue of prior invention. Further, the dates of publication provided may be different from the actual publication dates, which may need to be independently confirmed.

[053] The terms "comprises" and "comprising" should be interpreted as referring to elements, components, or steps in a non-exclusive manner, indicating that the referenced elements, components, or steps may be present, or utilized, or combined with other elements, components, or steps that are not expressly referenced.

[054] The subject headings used in the detailed description are included only for the ease of reference of the reader and should not be used to limit the subject matter found throughout the disclosure or the claims. The subject headings should not be used in construing the scope of the claims or the claim limitations.

[055] Although the technology herein has been described with reference to particular examples, it is to be understood that these examples are merely illustrative of the principles and applications of the technology. In some instances, the terminology and symbols may imply specific details that are not required to practice the technology. For example, although the terms "first" and "second" may be used, unless otherwise specified, they are not intended to indicate any order but may be utilised to distinguish between distinct elements. Furthermore, although process steps in the methodologies may be described or illustrated in an order, such an ordering is not required. Those skilled in the art will recognize that such ordering may be modified and/or aspects thereof may be conducted concurrently or even synchronously.

[056] It is therefore to be understood that numerous modifications may be made to the illustrative examples and that other arrangements may be devised without departing from the spirit and scope of the technology.

6. CLAIMS

1. A hand tool for use in disassembling components of a respiratory therapy system, the tool comprising an elongate handle portion, a tip portion provided to a first end of the handle portion and a forked portion provided to a second end of the handle portion, wherein the tip portion comprises a tapered wedge portion.
2. The hand tool of claim 1, wherein the forked portion comprises a pair of spaced apart legs, wherein an inner surface of each leg comprises an engagement formation configured to engage a predetermined component of a respiratory therapy system.
3. The hand tool of claim 2, wherein each engagement formation comprises a concave engagement surface.
4. The hand tool of claim 2 or 3, wherein each engagement formation comprises a plurality of substantially parallel channels.
5. The hand tool of claim 4, wherein each channel is open at a first end.
6. The hand tool of claim 4 or 5, wherein each channel is substantially transverse to a longitudinal axis of the hand tool.
7. The hand tool of claim 4, 5, or 6, wherein the predetermined component is a connector of a CPAP tube.
8. The hand tool of claim 7, wherein the channels are configured to engage ribs provided to the CPAP tube connector.
9. The hand tool of any one of claims 2 to 8, wherein each fork leg curves out of plane with the handle portion.
10. The hand tool of claim 1 or 2, wherein the engagement formation comprises a rib which is substantially aligned with the leg of the forked portion.
11. The hand tool of claim 10, wherein each leg further comprises a flange portion configured to operate, in use, as a cam surface or fulcrum portion.
12. The hand tool of claim 11, wherein a flange portion is provided on opposite sides of each leg.

13. The hand tool of any one of claims 1 to 12, wherein a plurality of ribs or fins are provided to outer lateral surfaces of the handle portion.
14. The hand tool of claim 13, wherein the ribs or fins are arranged substantially transversely to a longitudinal axis of the tool.
15. The hand tool of any one of the preceding claims, wherein the handle portion comprises two spaced apart handle members.
16. The hand tool of claim 15, wherein the handle members taper outwardly between the forked portion and the tip portion.
17. The hand tool of any one of the preceding claims, wherein the tip portion comprises a tapered wedge portion.
18. The hand tool of claim 17, wherein the tip portion is provided with one or more protruding abutment portions.
19. The hand tool of claim 18, wherein each abutment portion comprises an abutment surface which extends across the entire width of the wedge portion.
20. The hand tool of claim 19, wherein the abutment surface comprises a surface of a portion of increased thickness of the tip portion.

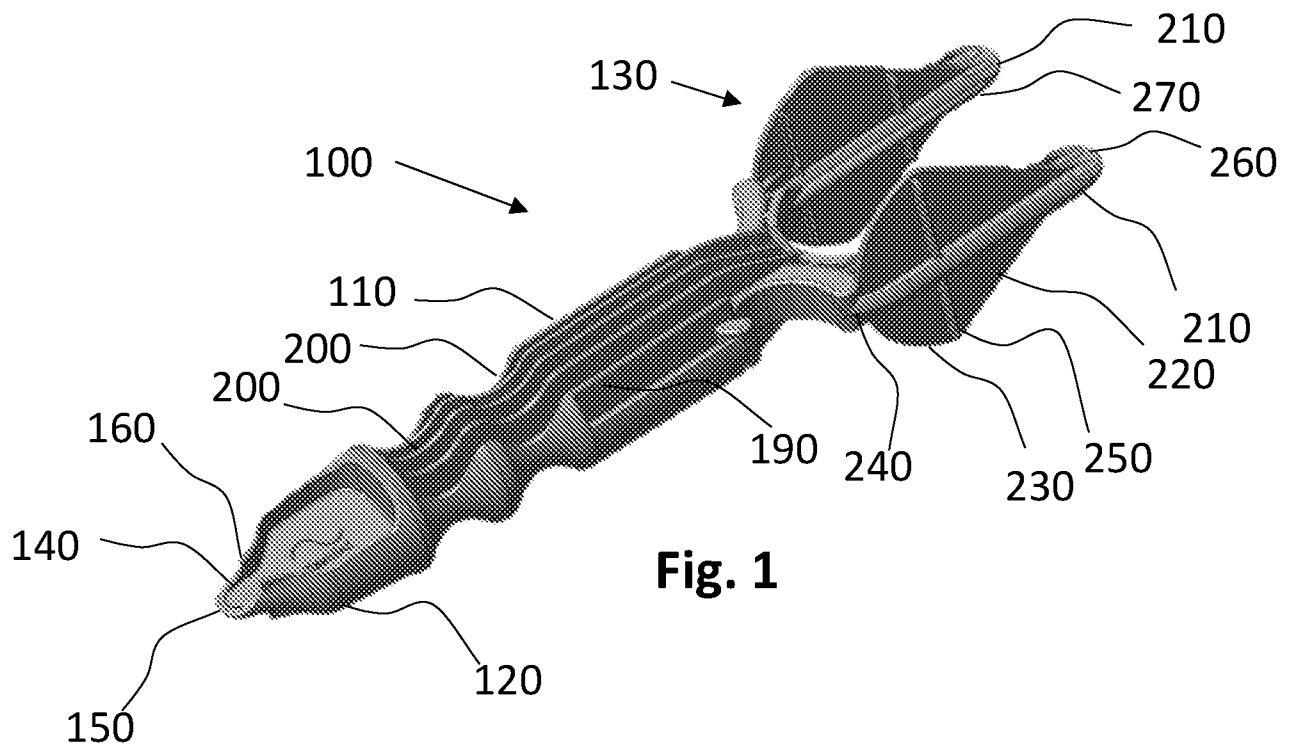
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Fig. 1

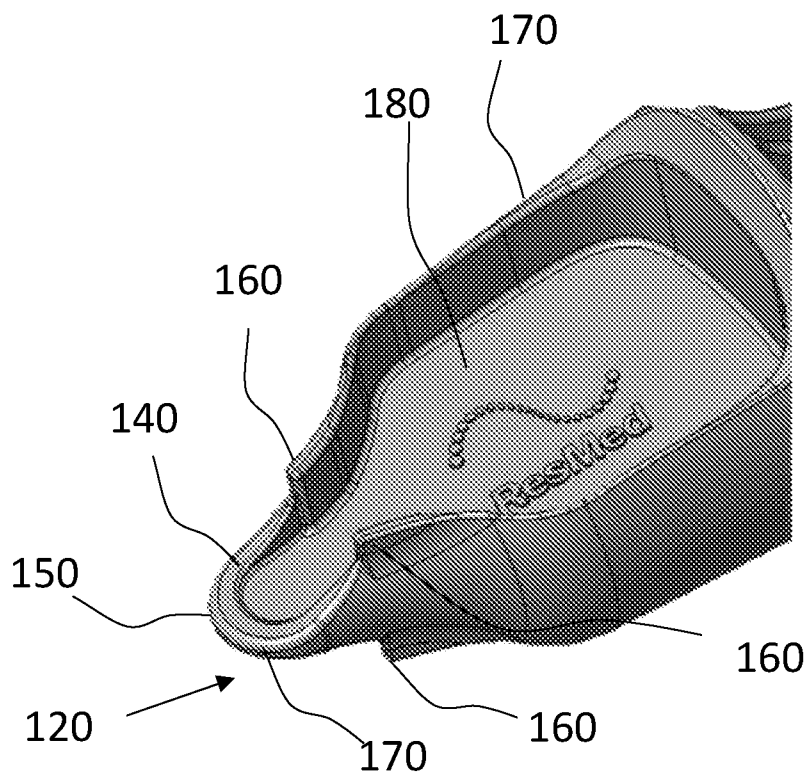


Fig. 2A

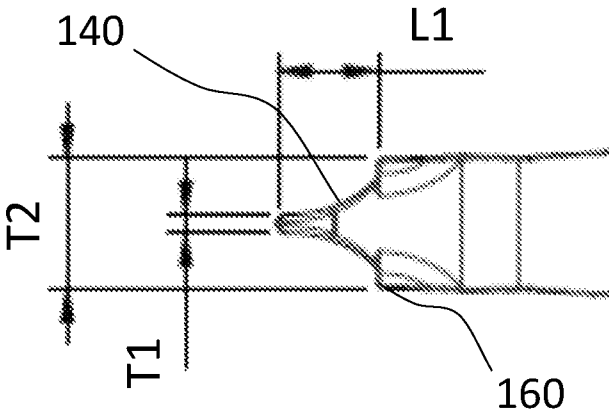


Fig. 2B

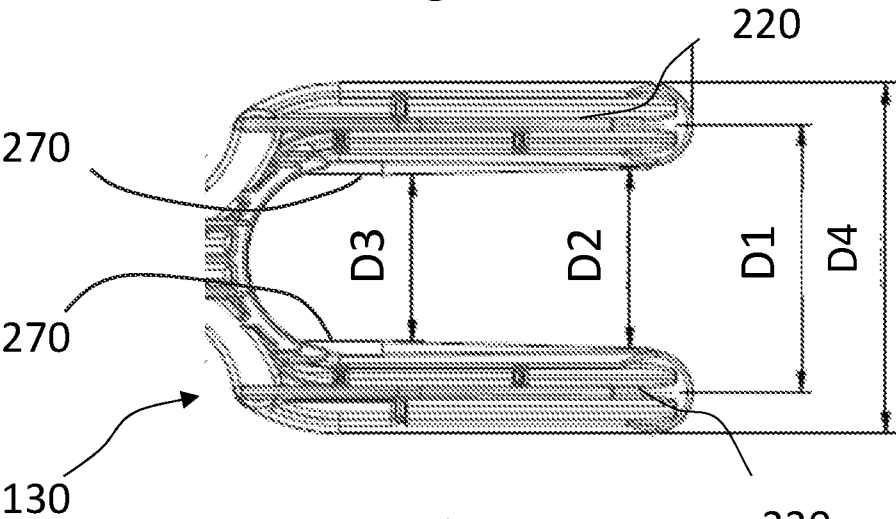


Fig. 2C

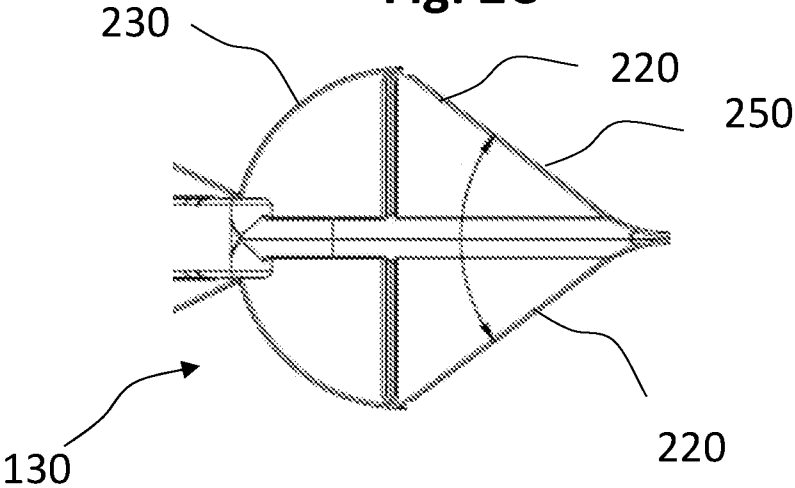


Fig. 2D

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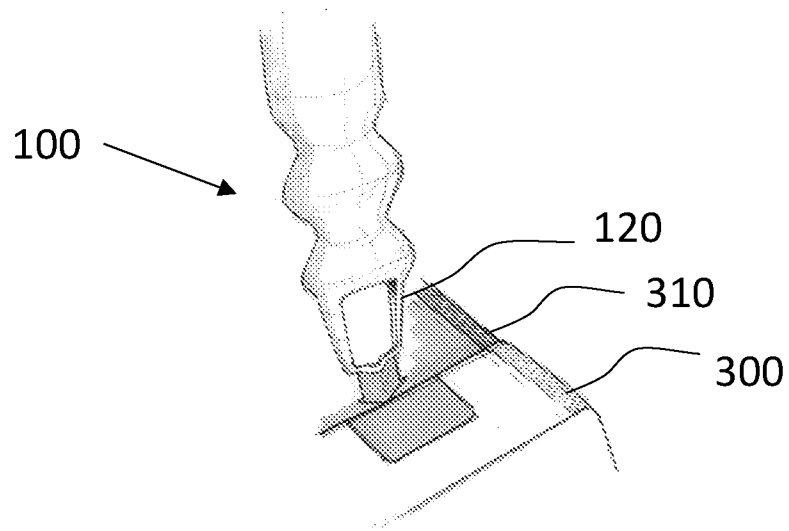


Fig. 3

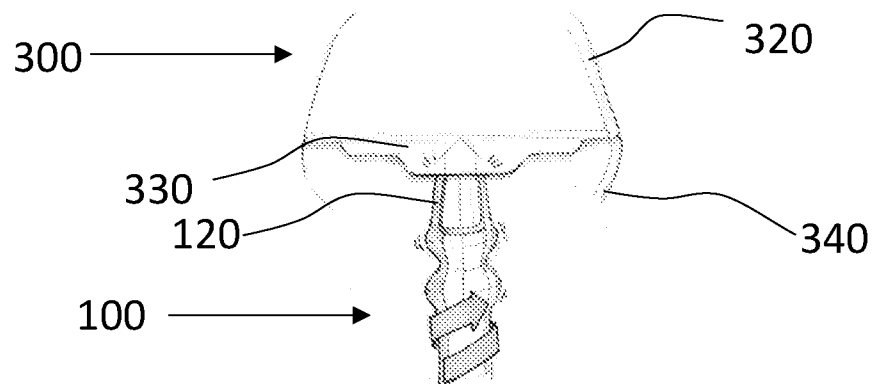


Fig. 4

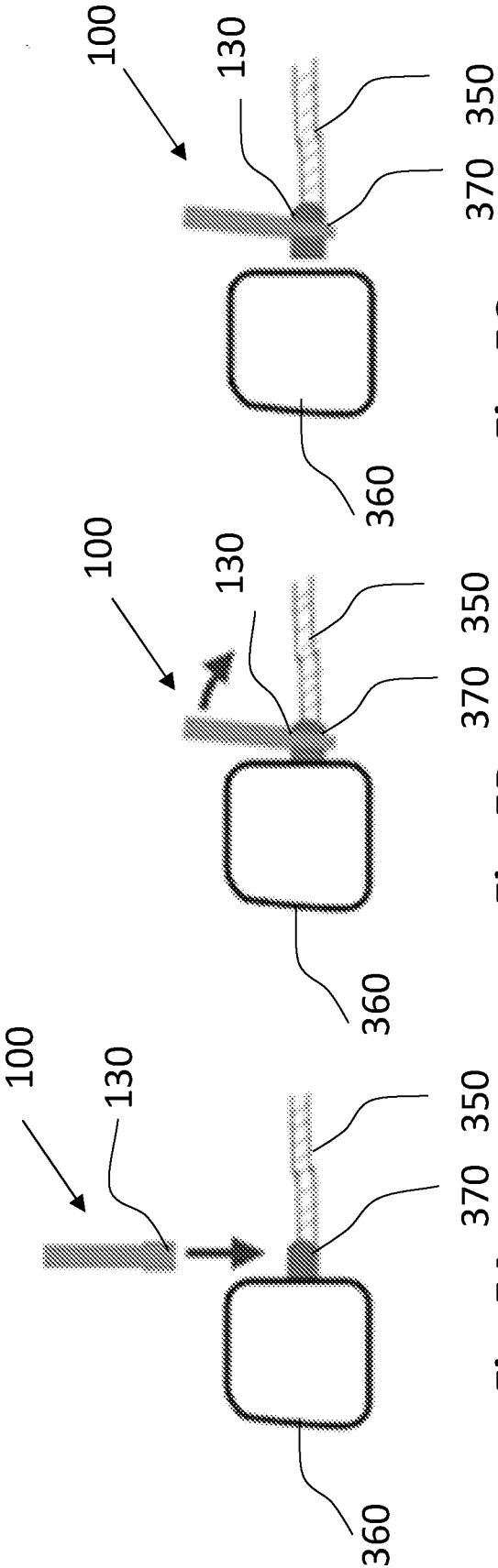


Fig. 5C

Fig. 5B

Fig. 5A

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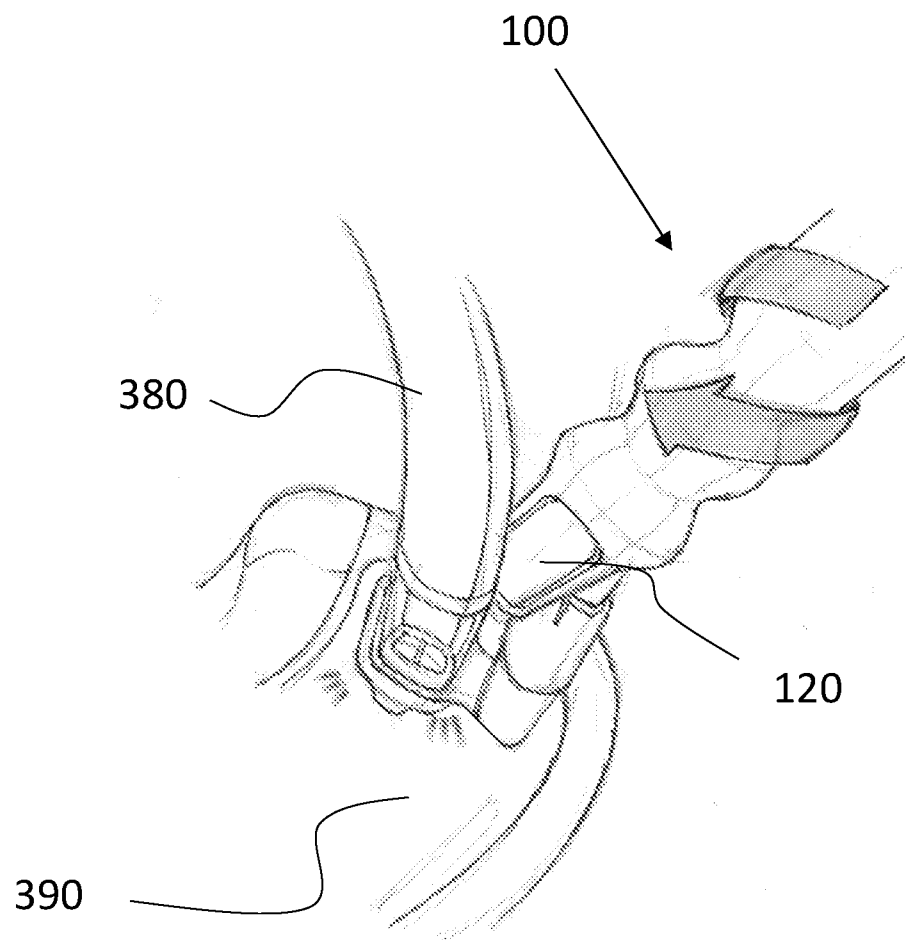


Fig. 6

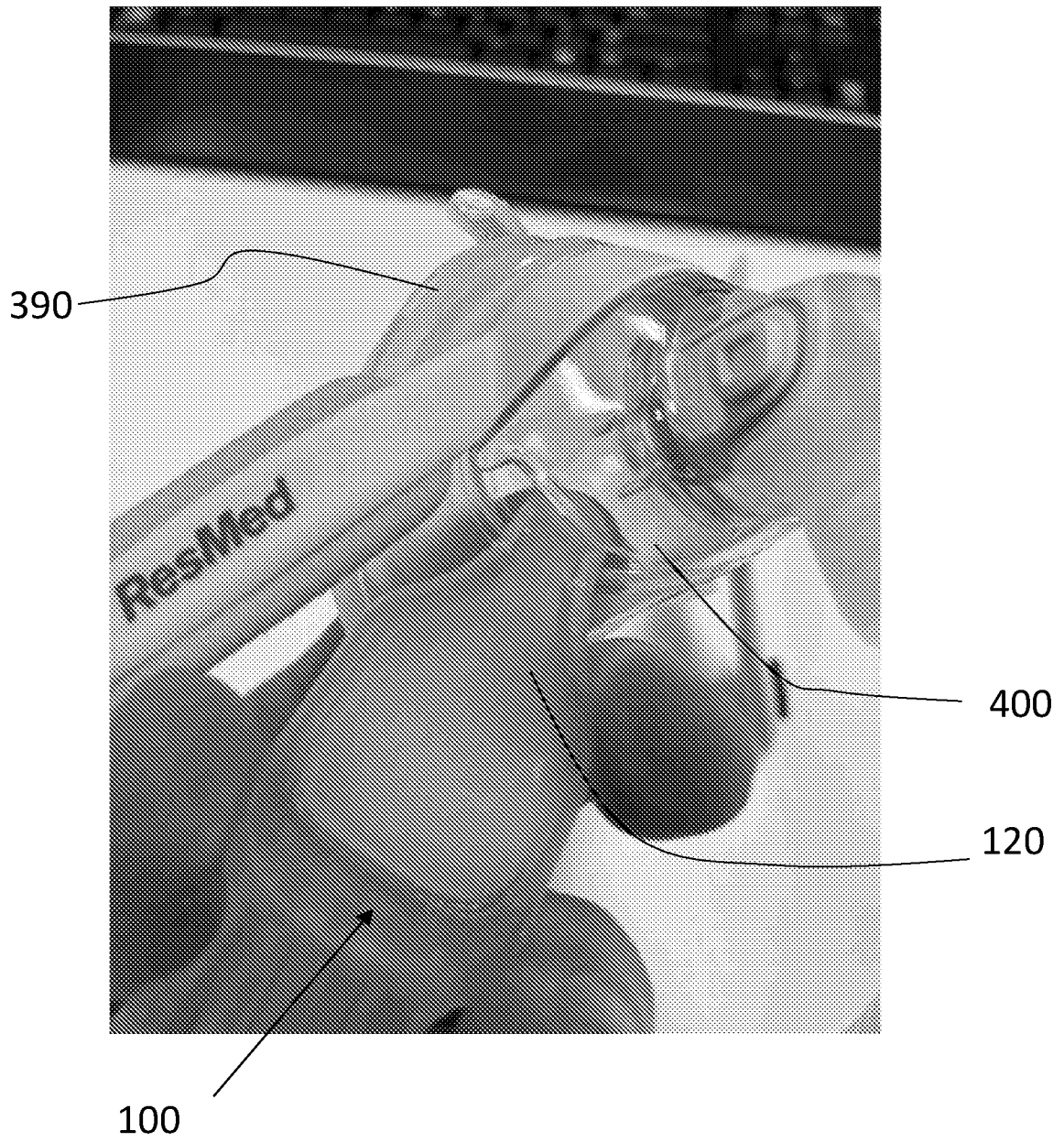


Fig. 7

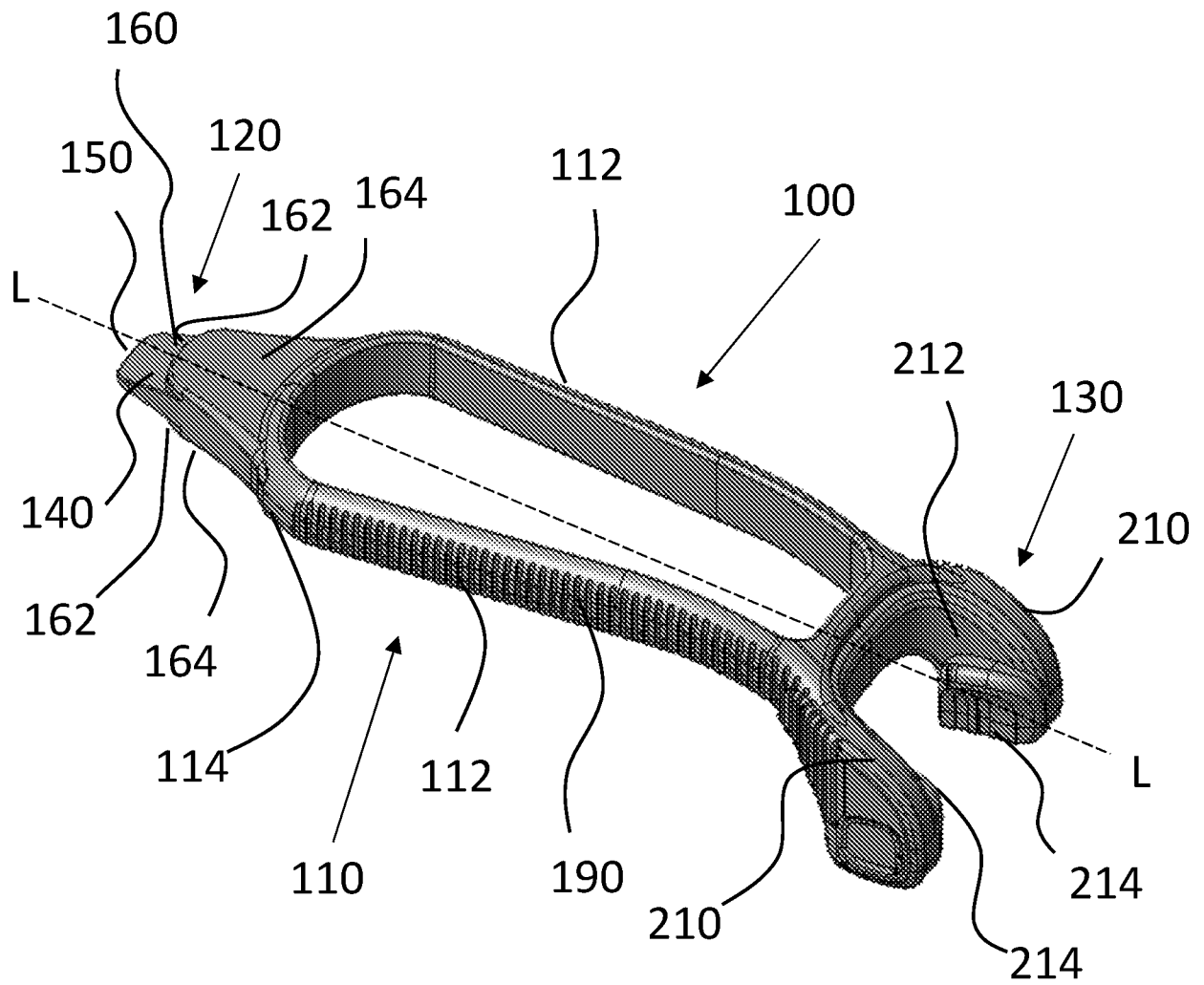


Fig. 8

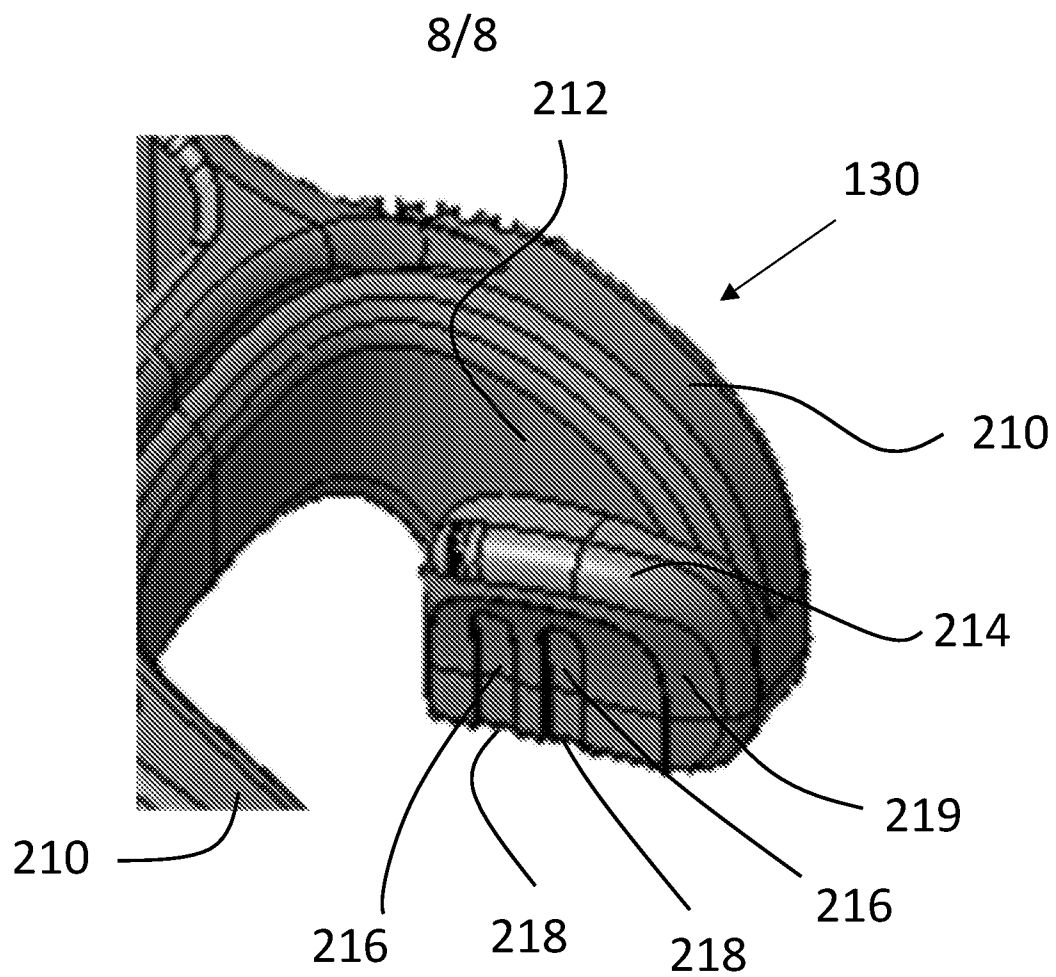


Fig. 8A

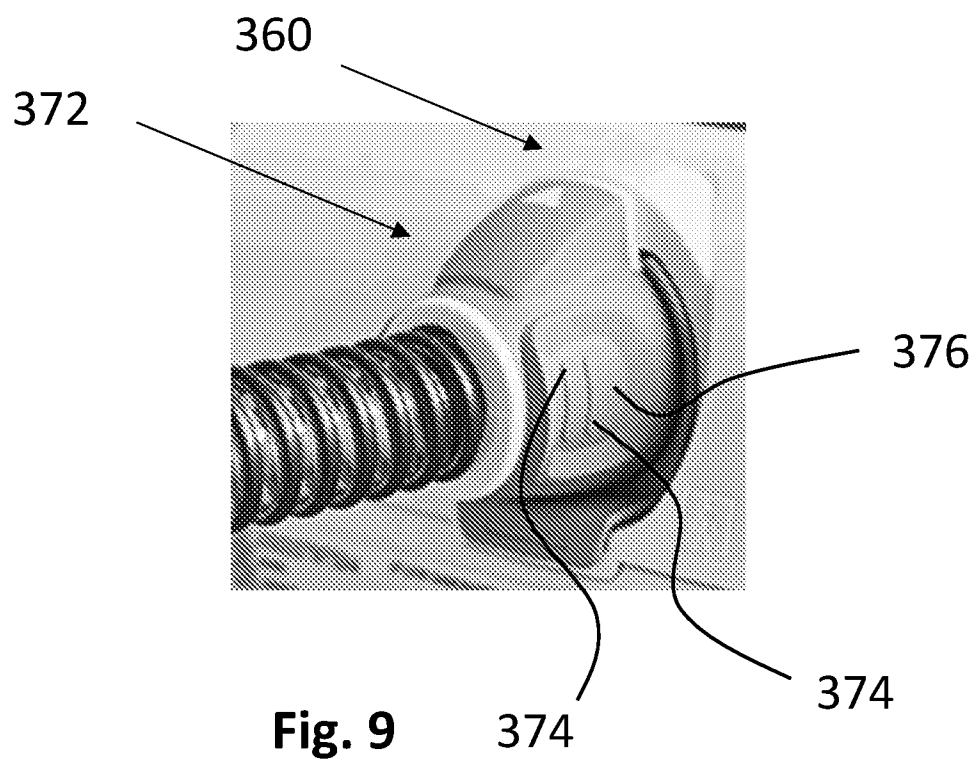


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2024/051352

A. CLASSIFICATION OF SUBJECT MATTER

**A61M 16/00 (2006.01) A61B 17/00 (2006.01) A61B 90/00 (2016.01) A61B 90/70 (2016.01) A61M 16/06 (2006.01)
A61M 16/08 (2006.01) A61M 16/16 (2006.01) A61M 39/08 (2006.01) A61M 39/10 (2006.01) B25B 9/02 (2006.01)
B25B 27/02 (2006.01) B25B 27/10 (2006.01) B25F 1/00 (2006.01) B25G 1/10 (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)

PATENW cluster (EPODOC, WPIAP, TXTE Cluster); CPC/IPC/FI/FT as appropriate A61M2209/04, A61M2039/087, A61M16/0003, A61M16/06, A61M16/0816, A61M16/0875, A61M16/16, A61M39/08, A61M39/10, B25B9/02, B25B27/02, B25B27/10, B25B27/14, B25F1/00, B66F15/00. Classification used in various combinations and with selected keywords: Pry, grip, pull, tube, conduit, disassemble, tool, CPAP, respiratory device, fork, taper, handle and similar terms.

Applicant and inventor names searched in IP Australia internal databases.

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	

☒ Further documents are listed in the continuation of Box C

☒ 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	"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
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"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search
24 March 2025

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INTERNATIONAL SEARCH REPORT		International application No.
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		PCT/AU2024/051352
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2008/0315165 A1 (PRATER JEREMY CARL; TREJO KEVIN MICHAEL) 25 December 2008 Figs. 1-4, [0025].	1-20
X	US 2021/0237250 A1 (ILLINOIS TOOL WORKS) 05 August 2021 Figs. 1, 6, 13-15, [0063].	1-20
X	TW 2017/22635 A1 (YU JIA-FENG) 01 July 2017 Figs. 1-6.	1-20
X	US 2008/0269677 A1 (CULL DAVID L.) 30 October 2008 Figs. 5-6.	1-20
X	CN 212385377 U (DALAI NUR COAL IND CO LTD) 22 January 2021 Figs. 11-15.	1-20
A	US 8297594 B1 (ONTIVEROS STEVE) 30 October 2012 Figs. 1-2	1-20
A	US 5695172 A (HREHA; KENNETH W.) 09 December 1997 Whole document.	1-20
A	US 2010/0170072 A1 (ELZEY JAY PRICE) 08 July 2010 Whole document.	1-20
A	EP 2322326 A1 (NOSSBAUM, FREDERIK DANIEL) 18 May 2011 Whole document.	1-20
A	CN 212794802 U (FAW JIEFANG AUTOMOTIVE CO) 26 March 2021 Whole document.	1-20

Form PCT/ISA/210 (fifth sheet) (July 2019)

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2024/051352	
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 2008/0315165 A1	25 December 2008	US 2008315165 A1	25 Dec 2008
		US 7735806 B2	15 Jun 2010
US 2021/0237250 A1	05 August 2021	US 2021237250 A1	05 Aug 2021
		US 11376724 B2	05 Jul 2022
		KR 20190094236 A	12 Aug 2019
		WO 2018111435 A1	21 Jun 2018
TW 2017/22635 A1	01 July 2017	None	
US 2008/0269677 A1	30 October 2008	US 2008269677 A1	30 Oct 2008
		US 8211056 B2	03 Jul 2012
		CA 2620020 A1	01 Mar 2007
		EP 1916940 A2	07 May 2008
		EP 1916940 B1	02 Oct 2013
		JP 2009511093 A	19 Mar 2009
		WO 2007024995 A2	01 Mar 2007
CN 212385377 U	22 January 2021		
US 8297594 B1	30 October 2012	US 8297594 B1	30 Oct 2012
US 5695172 A	09 December 1997	US 5695172 A	09 Dec 1997
		CA 2212717 A1	28 Feb 1998
US 2010/0170072 A1	08 July 2010	US 2010170072 A1	08 Jul 2010
EP 2322326 A1	18 May 2011	EP 2322326 A1	18 May 2011
CN 212794802 U	26 March 2021		
End of Annex			
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			