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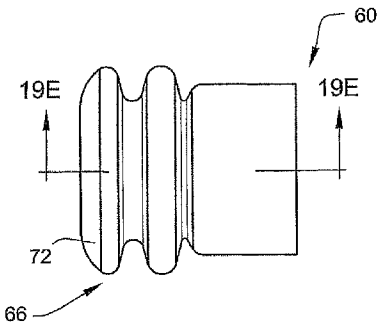


(57) **Abstract:** A CPAP device includes a flow generator including an outlet, a humidifier including an inlet, and an adaptor connector between the outlet of the flow generator and the inlet of the humidifier. The connector includes a flexible and conformable sealing portion that is movable to accommodate misalignment.

WO 2007/019627 A1

COMPLIANT COUPLING OR ADAPTOR

CROSS REFERENCE TO PRIORITY APPLICATION

[0001] This application claims the benefit of U.S. Provisional Application No. 60/707,948, filed August 15, 2005, incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to a compliant coupling or adaptor for use in communicating pressurized breathable gas between a blower or flow generator and a humidifier tub for a Continuous Positive Airway Pressure (CPAP) device used to treat sleep disordered breathing (SDB) conditions such as Obstructive Sleep Apnea (OSA).

BACKGROUND OF THE INVENTION

[0003] Domestic treatment of OSA and other SDB is usually done using a device that provides CPAP, e.g., nasal CPAP. A common configuration of a treatment system comprises a CPAP device and a patient interface, e.g., a nasal mask. The nasal mask forms a sealing interface with the patient's nasal passages in use so that the supply of air at positive pressure from the CPAP device may be delivered to the patient's airways. In this way, while the patient is wearing a nasal mask, their mouth is uncovered.

[0004] hi some situations, patients "mouth breath" during sleep. When this happens while wearing only a nasal mask, air can pass in the mask and straight out the patient's mouth. This can lead to drying of the patient's airway and patient discomfort. This patient discomfort can to some extent be alleviated by the use of a humidifier placed between the CPAP device and the patient interface.

[0005] Many humidifiers are available, although the most convenient form is one that is either integrated with or configured to be coupled to the relevant CPAP device. While passive humidifiers can provide some relief, generally a heated humidifier is required to provide sufficient moisture to the air so that patients will be comfortable. Humidifiers typically comprise a water tub having a capacity of several hundred milliliters, a heating

element, a control to enable the level of humidification to be varied, an air inlet to receive air from the blower, and an air outlet adapted to be connected to an air delivery conduit so that the humidified pressurized air may be passed to the patient interface. Usually, the water tub is removable from the system so that it can be refilled when necessary.

[0006] In making a humidification tub removable, there are three problems that need to be overcome. First, there is a need for an air seal between the air outlet of the flow generator and the air inlet of the humidifier tub. An air seal reduces air leaks that may result in an increased pressure drop between the air pressure generated by the flow generator and the air pressure delivered to the patient at the patient interface. Second, for efficient humidification, there must be adequate thermal contact between the humidification tub and tiie heating element. Third, it is necessary to properly align and couple the humidifier tub and the flow generator, hi some cases, a system base or cradle is provided to facilitate the correct assembly of the flow generator with the humidifier.

SUMMARY OF THE INVENTION

[0007] One aspect of the invention relates to a coupling, adaptor and/or seal between the humidifier inlet and flow generator outlet.

[0008] Another aspect of the invention relates to a CPAP device including a flow generator including an outlet, a humidifier including an inlet, and a connector between the outlet of the flow generator and the inlet of the humidifier. The connector includes a flexible and conformable sealing portion that is movable to accommodate misalignment.

[0009] Another aspect of the invention relates to an adaptor for a CPAP device, said adaptor communicating pressurized gas between an outlet of a flow generator and an inlet of a humidifier, the adaptor including a main body having first and second ends, the first end structured to be coupled to one of the inlet and the outlet and the second end having a flexible and conformable sealing portion that is movable to accommodate misalignment between the flow generator and the humidifier.

[0010] Other aspects, features, and advantages of this invention will become apparent from the following detailed description when taken in conjunction with the accompanying drawings, which are a part of this disclosure and which illustrate, by way of example, principles of this invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The accompanying drawings facilitate an understanding of the various embodiments of this invention. In such drawings:

[0012] Fig. 1 is a perspective view of a CPAP device according to an embodiment of the invention;

[0013] Fig. 1.1 is a perspective view of a humidifier tub supported by a cradle according to an embodiment of the present invention;

[0014] Fig. 2 illustrates a perspective view of a blower with a seal/connector according to an embodiment of the present invention;

[0015] Fig. 3 illustrates the blower and seal/connector of Fig. 5 in an exploded position;

[0016] Fig. 4 is a cross section along section 4-4 of Fig. 2;

[0017] Fig. 5 is a perspective view of a humidifier and the seal shown in Figs. 2-4;

[0018] Fig. 6 is a cross sectional view of the humidifier and seal shown in Fig. 5;

[0019] Fig. 7 is a cross-sectional view illustrating a seal/connector according to another embodiment of the present invention;

[0020] Figs. 7B-7C illustrate a seal/connector according to an embodiment of the present invention;

[0021] Figs. 8A-8E illustrate a seal/connector according to another embodiment of the present invention;

[0022] Figs. 9A-9E illustrate a seal/connector according to another embodiment of the present invention;

[0023] Figs. 10A-1OE illustrate a seal/connector according to another embodiment of the present invention;

[0024] Figs. 1IA-I IE illustrate a seal/connector according to another embodiment of the present invention;

[0025] Figs. 12A-12E illustrate a frame attaching portion for the seal/connector shown in Figs. 1IA-I IE;

[0026] Figs. 13A-13E illustrate a seal portion for the seal/connector shown in Figs. 1IA-I IE;

[0027] Figs. 14A-14E illustrate a seal/connector according to another embodiment of the present invention;

[0028] Figs. 15A-1 5E illustrate a frame attaching portion for the seal/connector shown in Figs. 14A-14E;

[0029] Figs. 16A-16E illustrate a seal portion for the seal/connector shown in Figs. 14A-14E;

[0030] Figs. 17A-17E illustrate a seal/connector according to another embodiment of the present invention;

[0031] Figs. 18A-1 8E illustrate a frame attaching portion for the seal/connector shown in Figs. 17A-17E;

[0032] Figs. 19A-19E illustrate a seal/connector according to another embodiment of the present invention; and

[0033] Figs. 20A-20E illustrate a seal/connector according to another embodiment of the present invention.

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENTS

1. CPAP Device

[0034] Fig. 1 illustrates a CPAP device 10 according to an embodiment of the present invention. As illustrated, the CPAP device 10 includes a flow generator 20 and a humidifier 30 adapted to be coupled to the flow generator 20. The humidifier 30 and the flow generator 20 may be mounted to or supported by a common support or cradle.

2. Humidifier

[0035] The humidifier 30 includes a humidifier tub 50 having a base plate 52 sealed to the bottom of the tub 50. The humidifier 30 includes or is otherwise associated with a heating element or plate that maybe provided to a cradle 40 (Fig. 1.1). The cradle 40 includes a portion for supporting the flow generator. The tub 450 in Fig. 1.1 is slightly different from tub 50 in Fig. 1, .e.g., tub 450 includes flattened sides 482 to facilitate

alignment with cradle 40. The tub 50 includes an inlet 54 adapted to be in fluid communication with (i.e. not necessarily directly) the outlet 24 of the flow generator 20, and an outlet 56 adapted to be connected to an air delivery conduit. The air delivery conduit includes one end coupled to the outlet 56 of the tub 50 and an opposite end coupled to a patient interface. The patient interface comfortably engages the patient's face and provides a seal. The patient interface may have any suitable configuration as is known in the art, e.g., full-face mask, nasal mask, oro-nasal mask, mouth mask, nasal prongs, etc.

[0036] The tub 50 and base plate 52 define a chamber that is adapted to receive a volume of water, e.g., several hundred milliliters. The inlet 54 and the outlet 56 are both in communication with the chamber. In use, a supply of pressurized air from the flow generator 20 enters the inlet 54 of the tub 50 and collects moisture through contact with the water within the tub 50 before continuing on to the outlet 56 and to the patient via the air delivery conduit.

[0037] The humidifier tub 50 may be structured such as the humidifier described in U.S. Patent Application No. 60/707,949, entitled "Humidifier Tub For CPAP Device", filed August 15, 2005, the contents of which are incorporated in its entirety by reference herein. Also, the flow generator 20 may be structured and controlled such as the flow generator described in U.S. Patent Application No. 60/707,951, entitled "Low Cost CPAP Flow Generator and Humidifier Assembly", filed August 15, 2005, the contents of which are incorporated in its entirety by reference herein.

3. Seal Between Humidifier and Flow Generator

[0038] Figs. 2-4 illustrate a connector 60 according to an embodiment of the present invention. The connector 60 interconnects the outlet 24 of the flow generator 20 and the inlet 54 of the tub 50. Moreover, the connector 60 provides a pressure-activated or 'self-energizing' face seal that provides a seal between the flow generator 20 and the tub 50 upon docking, coupling and/or activation of the flow generator. The seal accommodates misalignment and manufacturing tolerances as described below.

[0039] As illustrated, the connector **60** provides a channel **62** (Fig. **4)** to deliver pressurized air from the flow generator **20** to the humidifier tub **50.** In the illustrated

embodiment, the connector 60 is removably attached to the flow generator 20 and is structured to sealingly engage with the inlet 54 of the tub 50.

[0040] As best shown in Fig. 4, the connector 60 in this example includes two components that are coupled to one another. Specifically, the connector 60 includes a firm frame attaching portion 64 and a flexible sealing portion 66. The firm frame attaching portion 64 is preferably constructed of a plastic material and includes an attachment structure that enables secure attachment to the outlet 24 of the flow generator 20. For example, the attachment structure may be in the form of a snap-fit clip that includes one ore more protrusions 68 adapted to engage within a corresponding groove 70 provided in the outlet 24 with a snap fit, as shown in Fig. 4. However, the attachment structure may have other suitable configurations.

[0041] The flexible sealing portion *66* comprises a bellows-type conforming face seal 72 preferably made from silicone or other similar material that does not provide problems with creep in use. The bellows-type conforming face seal 72 comprises an aperture 74 that is adapted to abut the inlet 54 of the humidifier tub 50. The flexible sealing portion *66* further includes an internal sealing element 76, e.g., wiper seal, that independently seals to the outlet 24 of the flow generator 20 to prevent air leakage through the connection between the flow generator 20 and the humidifier tub 50. Any means of providing a seal between the flow generator 20 and humidifier tub 50 is encompassed within the scope of the invention. For example, the internal sealing element 76 may be in the form of a compression sealing ridge or a wiper seal. The flexible sealing portion *66* is constructed such that it preferably does not have any split lines (from the tooling) on the outer sealing face that may interfere with obtaining a satisfactory pressure seal.

[0042] hi addition, the flexible sealing portion *66* includes an interlocking structure that is structured to interlockingly engage a complementary interlocking structure provided on the firm frame attaching portion 64. In the illustrated embodiment, the sealing portion *66* includes a groove 78 that interlocks with a protrusion 80 provided on the frame attaching portion 64. This arrangement interlocks the sealing portion *66* to the frame attaching portion 64. However, the sealing portion 66 may be coupled to the frame attaching portion 64 in other suitable manners.

[0043] Alternatively, the entire connector 60 may be made of silicone or a silicone-like material with differing rigidity characteristics for the firm frame attaching portion 64 and the flexible sealing portion *66*. For example, as shown in Fig. 7, the connector 60 may have a one-piece construction and the frame attaching portion 64 may have a cylindrical structure adapted to sealingly engage the outlet 24 of the flow generator 20.

[0044] Preferably, the connector 60 has a round shape to provide minimal out-of-mold distortion. The face seal 72 of the flexible sealing portion *66* has approximately 2 mm to 3 mm interference from the nominal contact point to ensure sufficient contact when the connector 60 is pushed against the inlet 54 of the humidifier tub 50. The aperture 74 on the sealing face 72 may be larger than the inlet 54 of the tub 50 in order to accommodate the various misalignment and manufacturing tolerances of the connector 60 to outlet 24 of the flow generator 20, to ensure sufficient passage of air flow through the connector 60.

[0045] Advantageously, the face seal 72 provides for tolerance in movement in all directions while aligning the humidifier tub 50 and the flow generator 20. For example, the face seal 72 is flexible axially (forwards and backwards), laterally (upwards, downwards, and/or sideways), angularly, pivotally, and/or rotationally. Preferably, the face seal is flexible in all directions, although it may be more flexible in some but more rigid in others.

[0046] The face seal 72 may be flexible within a predetermined range. For example, the face seal 72 may be axially and/or laterally flexible within a range of about 1-5 mm, preferably about 2-3 mm. However, the face seal 72 may be axially and/or laterally flexible less than 1 mm or greater than 5 mm. Also, the face seal 72 may be angularly, pivotally, and/or rotationally flexible within a range of about 1-10°, preferably about 3-6° or about 5°. However, the face seal 72 maybe angularly, pivotally, and/or rotationally flexible less than 1° or greater than 10°.

[0047] In use, the firm frame attaching portion 64 of the connector 60 is securely attached to the outlet 24 of the flow generator 20 and the bellows-type conforming face seal 72 on the flexible sealing portion *66* protrudes therefrom. The air inlet 54 of the humidifier tub 50 is positioned adjacent to or abutting the face seal 72. When pressurized air flows out through the outlet 24 of the flow generator 20, the face seal 72 fills with air and establishes a pressurized face seal with the inlet 54 of the humidifier tub 50.

[0048] Figs. 7B and 7C illustrate an embodiment of the connector 60 forming a seal with the inlet 54 of a humidifier tub. As shown in Fig. 7B, the connector 60 is positioned adjacent the inlet 54 such that the bellows-type conforming face seal 72 is spaced from the inlet 54. As pressurized air flows out through the outlet of the flow generator (as indicated by the arrow), the face seal 72 fills with air and expands into engagement with the axial end or axially facing surface of the inlet 54 as shown in Fig. 7C. That is, the face seal 72 balloons outwardly to form a cylindrical face seal with the inlet 54.

[0049] The bellows-type conforming face seal 72 provides a flexible bellows or gusset that allows the face seal 72 to self align with the inlet 54. That is, the flexibility and freedom of movement of the face seal 72 (e.g., in all directions within a predetermined range) allows the face seal 72 to form a seal with the inlet 54 even if they are misaligned. Specifically, the face seal 72 can still form a seal with the inlet 54 even if the axis of the connector 60 is not aligned with the axis of the inlet 54. This arrangement accommodates the various misalignments that may occur between the connector 60 and the inlet 54.

[0050] Although the connector 60 has been described as being attached to the outlet 24 of the flow generator 20, in an alternative embodiment the connector 60 maybe attached to the inlet 54 of the humidifier tub 50 and the flexible sealing portion *66* may abut the outlet 24 of the flow generator 20. In a further embodiment, the connector 60 may be permanently attached to either the outlet 24 of the flow generator 20 or the inlet 54 of the humidifier tub 50. However, the connector 60 is preferably a separate component that can be easily replaced or removed for cleaning or sterilization purposes.

[0051] **3.**1 Alternative Coupling Between Humidifier and Flow Generator

[0052] Figs. 8A-20E illustrate additional embodiments for coupling the flow generator to the humidifier tub. Common reference numbers are used to denote like parts. Each adaptor 60 includes a main body having a first end for connection to either the inlet of the humidifier tub or the outlet of the flow generator. A second end of the main body includes flexible sealing portion *66* having a face seal 72 that in the examples shown has one or more bellows portions or convolutions. The face seal is intended to be placed in contact with or adjacent to either the humidifier tub or the flow generator.

[0053] Figs. 8A-9E show two adaptor embodiments, each of which is provided with one or two (or more) protruding ridges 60.1 designed to provide an extra noise seal. In the

event or two or more ridges, they are axially spaced along the axis of the main body. As shown in Fig. 8E, the beginning of the bellows portion has a relatively sharp angle to provide more rigidity. Comparatively, the bellows portion in Fig. 9E is very compliant and allows a large tolerance to movement and positioning, hi Fig. 9E, the bellows portion has a gradually curved cross section. In Fig. 8E, the bellows portion has a first portion 60.2 that is gradually curved and a second portion 60.3 that is more sharply angled relative to the first portion.

[0054] The adaptor of Figs. 10A-10E is similar to the adaptor in Fig. 7, and is molded as a single piece that simply slides onto the flow generator outlet (or the humidifier tub inlet, depending on the arrangement). This design is very compliant and allows a large tolerance to movement and positioning, hi another variant (shown Figs. 20A-20E), one or more (three shown) slight protrusions 60.4 can be located within the bellows to better prevent the outer face from sucking inwards and sealing to or against the inside surface of the bellows due to any vacuum that may be created once the flow generator has been activated to generate pressurized flow of gas, e.g., in the range of 4-30 CmH_2O, typically 8-15 CmH_2O.

[0055] Figs. 1IA-E and Figs. 14A-E illustrate two embodiments having two piece designs, each adaptor or connector including a relatively rigid frame attaching portion (shown in isolation in Figs. 12A-E and 15A-E, respectfully) to attach to the flow generator outlet (or tub inlet) and a flexible bellows portion (shown in Figs. 13A-E and 16A-E, respectively) having a face seal to abut and seal to the tub inlet or the flow generator outlet. The frame attaching portion provides a firm attachment to the flow generator. The connection between the bellows portion and the frame attaching portion is similar to the embodiment of Fig. 4, in which the sealing portion includes a groove 78 and the frame attaching portion includes a protrusion 80. Thus, the bellows/sealing portion may be replaced as required. The frame portion in Figs. 14A-15E has flexible sides 60.5 that are squeezed inwards (using the finger grips shown) to facilitate repeated attaching and detaching of the adaptor from the flow generator outlet or the tub inlet. When the sides 60.5 are squeezed, the frame attaching portion takes on a more oval shape such that locking tabs 60.6 can be released from a corresponding flange that can be provided to either the tub inlet or the flow generator outlet.

[0056] Figs. 17A-18C illustrate an adaptor having a two part structure, including a sealing portion and a frame attaching portion that are connected to one another as described above. The sealing portion *66* is shown in isolation in Figs. 16A-16E. The frame attaching

portion includes one or more (three shown) flexible arms 60.7 each of which includes a locking tab 60.8.

[0057] Figs. 19A-19E illustrate an adaptor having two bellow portions with an axial gap 66.1 therebetween to provide a more compliant seal, while at the same time giving a wide tolerance to movement and positioning. This design is a single piece construction that simply slides onto the flow generator outlet port or the tub inlet. The adaptor includes an internal sealing element 60.9.

4.0 Mechanism for Retaining Humidifier in Cradle

[0058] The CPAP device 10 may include a cradle 40 (Fig. 1.1) structured to support the humidifier tub 50, 450 in an operative position with respect to the flow generator 20. The cradle 40 may include a heater element or plate that includes a heating element, e.g., a ceramic heating element. In use, the cradle 40 receives the humidifier tub 50, 450 so that the heating element is in thermal contact with the heat conducting base plate 52 (Fig. 1) of the humidifier tub 50, 450. This arrangement allows water contained within the humidifier tub 50 to be heated to provide sufficient moisture to the air so that patients will be comfortable.

[0059] The cradle 40 may provide one or more of the following functional features for the humidifier tub 50, 450: allow the humidifier tub 50, 450 to be correctly oriented with respect to the flow generator 20; securely lock the humidifier tub 50, 450 within the cradle such that it cannot be easily pulled out during use; ensure good thermal contact between the humidifier tub 50, 450 and the heater plate present in the cradle; allow easy docking of the humidifier tub 50, 450, especially for frail, elderly users; and for safety reasons, limit access to hot areas of the humidifier chamber when heat is being transferred from the heater plate to the heat conducting base plate 52 of the humidifier 30, once the humidifier tub 50, 450 is docked within the cradle.

[0060] While the invention has been described in connection with what are presently considered to be the most practical and preferred embodiments, it is to be understood that the invention is not to be limited to the disclosed embodiments, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the invention. Also, the various embodiments described above may be implemented in conjunction with other embodiments, e.g., aspects of one embodiment maybe combined with

aspects of another embodiment to realize yet other embodiments. Further, each individual feature or component of one embodiment alone may constitute and additional embodiment. In addition, while the invention has particular application to patients who suffer from OSA, it is to be appreciated that patients who suffer from other illnesses (e.g., congestive heart failure, diabetes, morbid obesity, stroke, barriatric surgery, etc.) can derive benefit from the above teachings. Moreover, the above teachings have applicability with patients and non-patients alike in non-medical applications.

WHAT IS CLAIMED IS:

1. An adaptor for a CPAP device, said adaptor communicating pressurized gas between an outlet of a flow generator and an inlet of a humidifier, the adaptor including a main body having first and second ends, the first end structured to be coupled to one of the inlet and the outlet and the second end having a flexible and conformable sealing portion that is movable to accommodate misalignment between the flow generator and the humidifier.

2. The adaptor according to claim 1, wherein the main body includes at least one annular ridge provided on an outer surface of the main body between the first and second ends.

3. The adaptor according to claim 2, wherein the at least one annular ridge includes two annular ridges axially spaced from one another.

4. The adaptor according to claim 1, wherein the first end is removably attachable to the outlet of the flow generator.

5. The adaptor according to any one of claims 2-3, wherein the adaptor includes first and second components that are coupled to one another.

6. The adaptor according to claim 4, wherein the first component includes a frame attaching portion that provides the first end and the second component provides the second end.

7. The adaptor according to claim 6, wherein the frame attaching portion is relatively firm or rigid compared to the flexible and conformable sealing portion.

8. The adaptor according to claim 6, wherein the frame attaching portion has a plurality of flexible arms that can be flexed to releasably engage the outlet or inlet.

9. The adaptor according to any one of claims 6-7, wherein the frame attaching portion includes flexible sides.

10. The adaptor according to any one of claims 6-9, wherein the frame attaching portion is removably attached to one of the inlet and the outlet with a snap-fit.

11. The adaptor according to any one of claims 6-10, wherein the sealing portion is interlocked with the frame attaching portion.

12. The adaptor according to any one of claims 1-11, wherein the sealing portion includes a bellows portion defining a conforming face seal.

13. The adaptor according to claim 12, wherein the bellows portion has a first portion that is gradually curved and a second portion that is generally angled relative to the first portion in cross-section.

14. The adaptor according to claim 12, wherein the bellows has a gradually curved cross-sectional profile.

15. The adaptor according to claim 12, wherein the bellows portion includes first and second portions axially spaced along an axis of the main body, the first portion being provided at the second end and the second portion being adjacent to the first portion with an axial gap between the first and second portions to allow for mis-alignment.

16. The adaptor according to claim 12, wherein the bellows portion includes a structure to prevent collapse of the bellows portion.

17. The adaptor according to claim 12, wherein the structure includes one or more protrusions provided to an inside surface of the bellows portion.

18. The adaptor according to any one of claims 1-17, wherein the sealing portion includes an internal sealing element.

19. The adaptor according to any one of claims 1-4, wherein the adaptor has a one-piece construction.

20. The adaptor according to any one of claims 1-19, wherein at least a portion of the sealing portion is constructed of silicone.

21. The adaptor according to any one of claims 1-20, wherein the sealing portion is flexible axially, laterally, angularly, pivotally, and rotationally within a predetermined range.

22. The adaptor according to claim 21, wherein the sealing portion is axially and laterally flexible within a range of about 1-5 mm.

23. The adaptor according to any one of claims 21-22, wherein the sealing portion is angularly, pivotally, and rotationally flexible within a range of about 1-10°.

24. A adaptor according to claim 1, wherein the sealing portion includes a flexible bellows portion that is expandable to provide a seal with the inlet or the outlet.

25. A adaptor according to claim 1, wherein the sealing portion defines a cylindrical face seal adapted to seal with of the inlet or the outlet.

26. A CPAP device comprising:

a humidifier including the inlet; and

an adaptor according to any one of claims 1-25.

27. The CPAP device according to claim 26, further comprising a flow generator including the outlet.

28. The CPAP device according to any one of claims 26-27, further comprising a cradle to support the flow generator and humidifier.

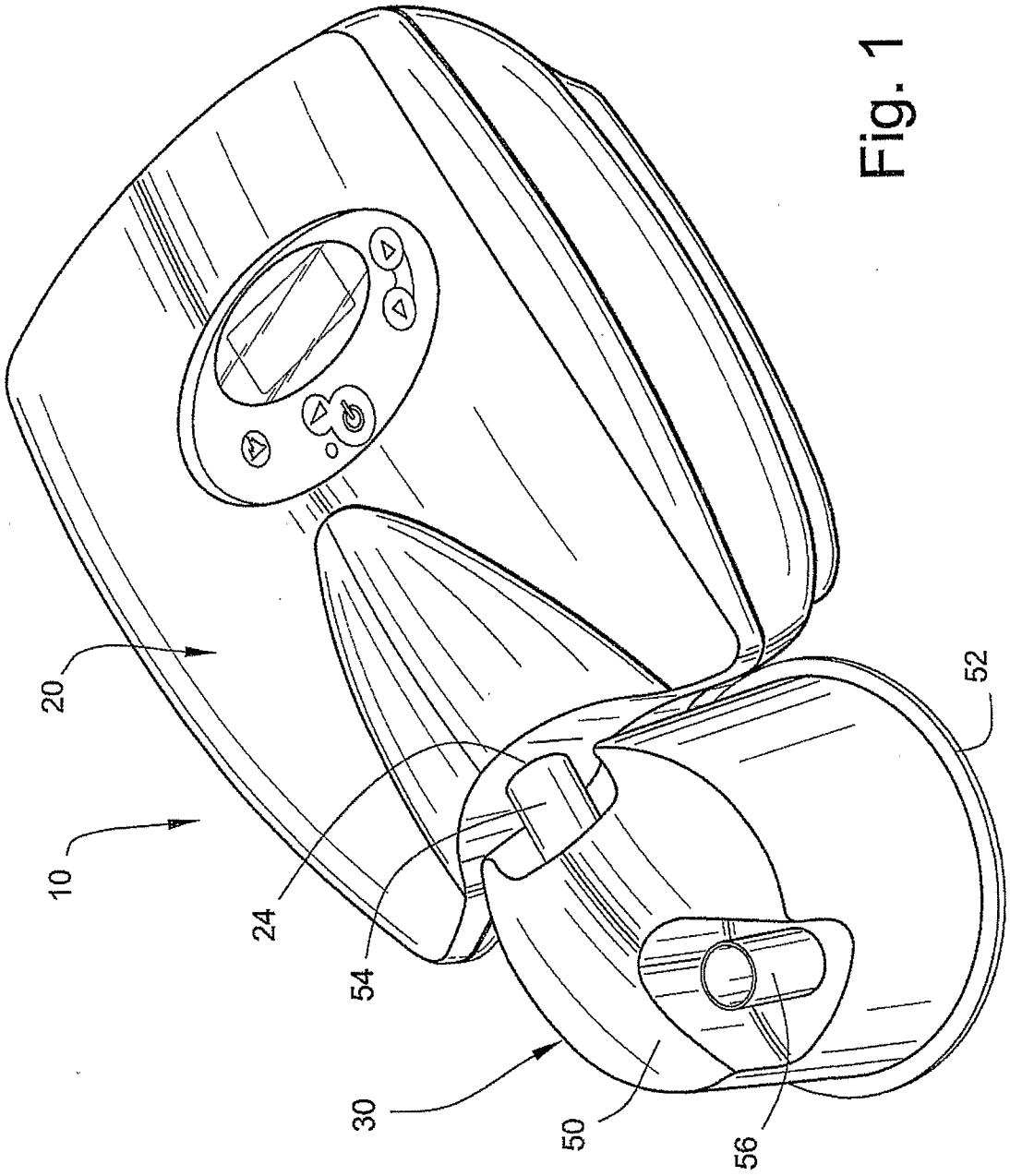


Fig. 1

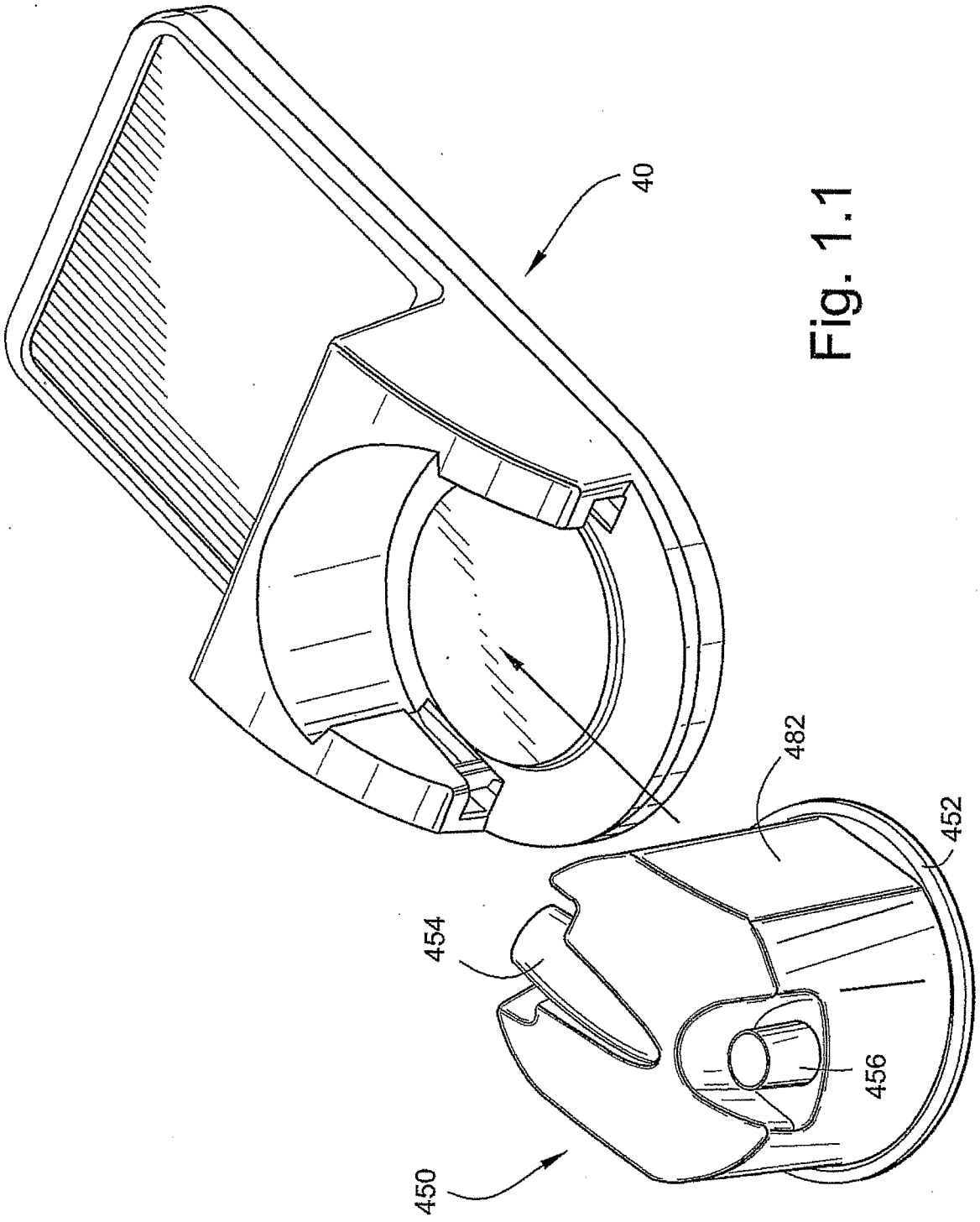


Fig. 1.1

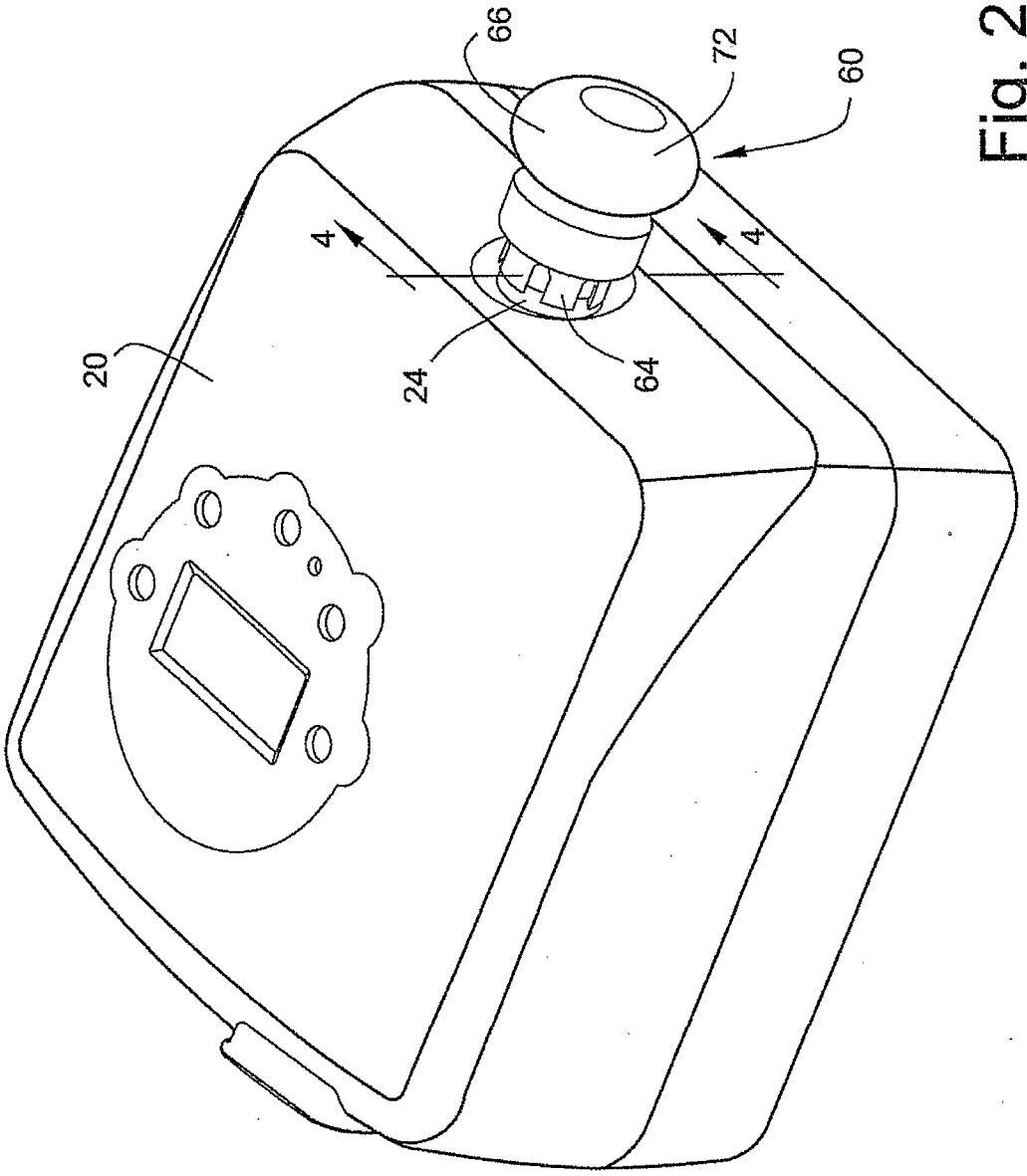


Fig. 2

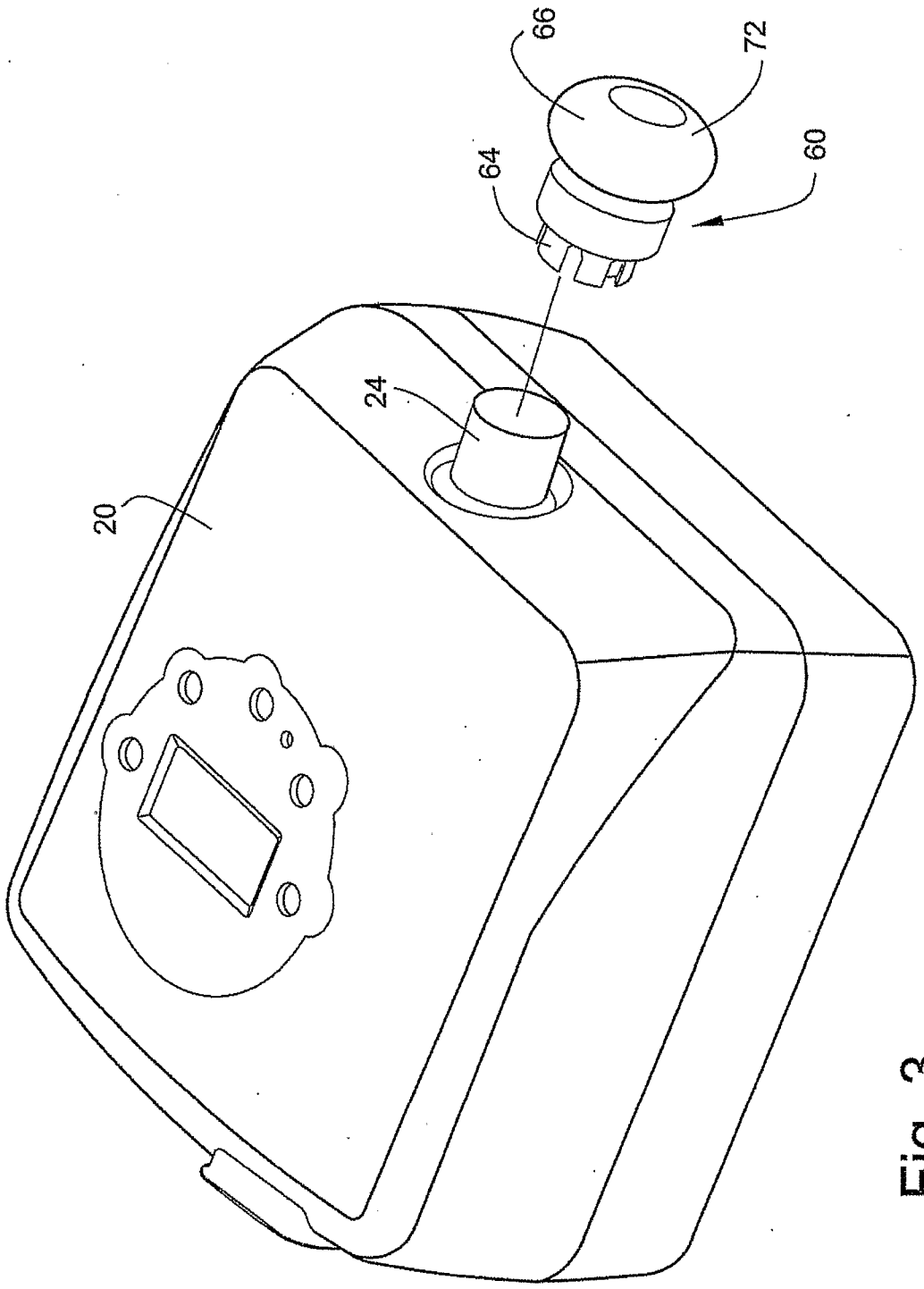


Fig. 3

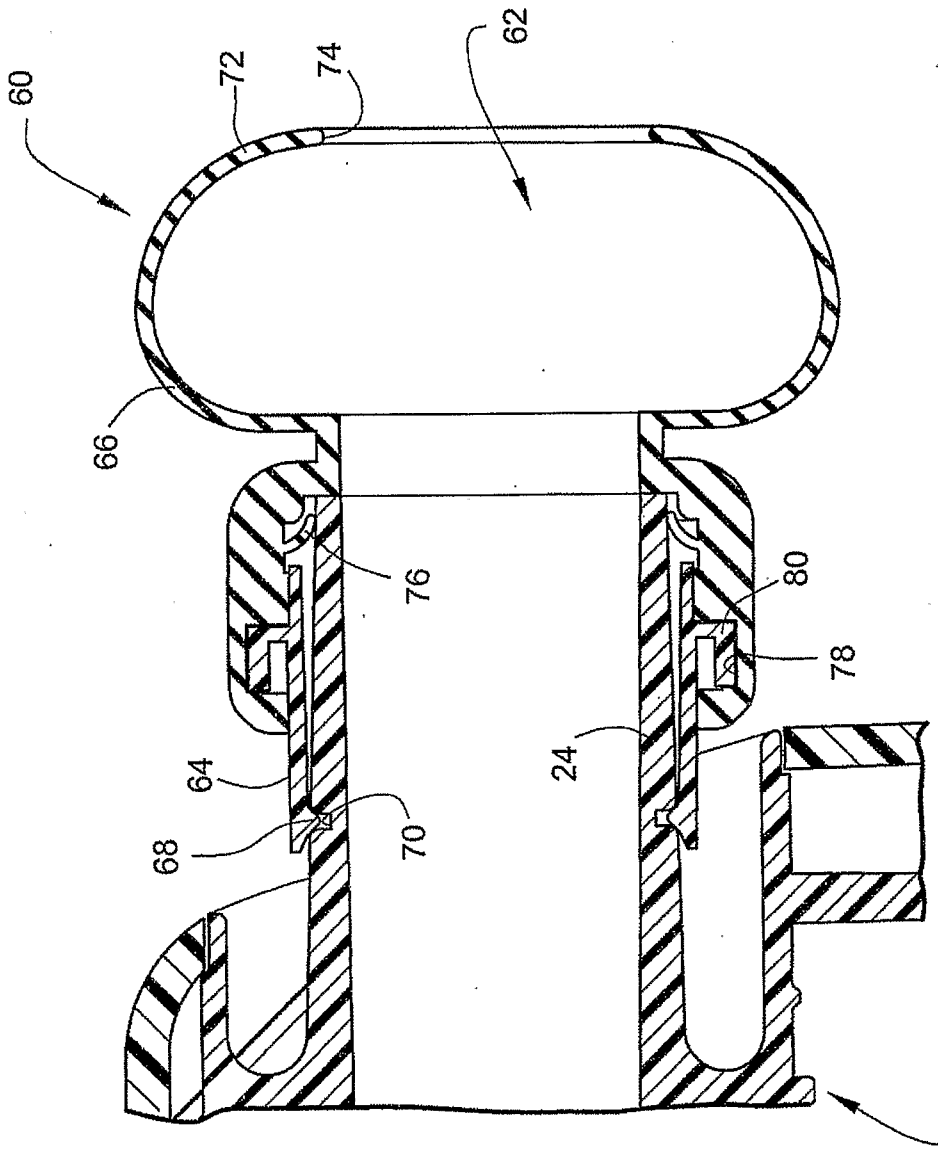
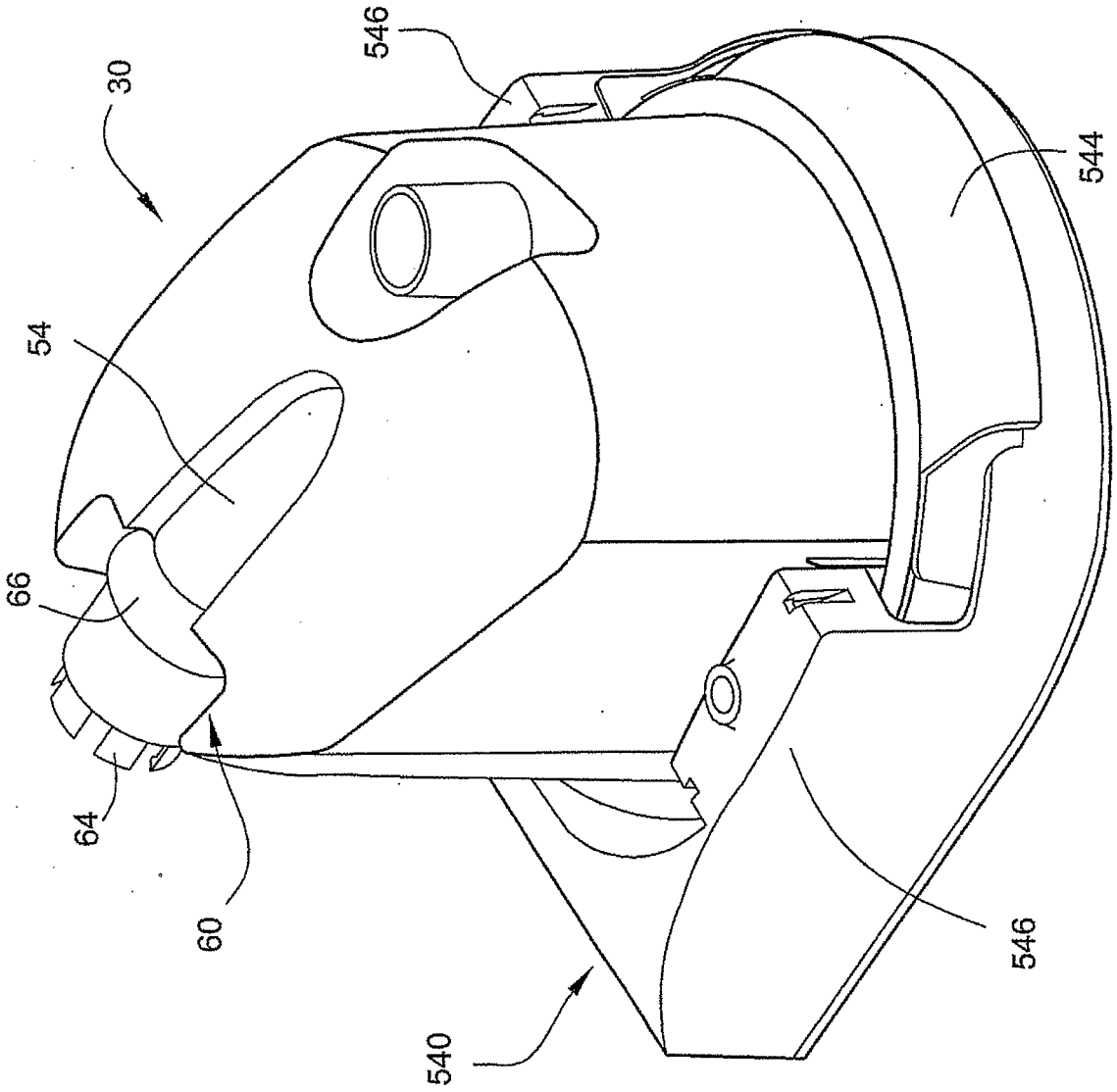


Fig. 4

Fig. 5



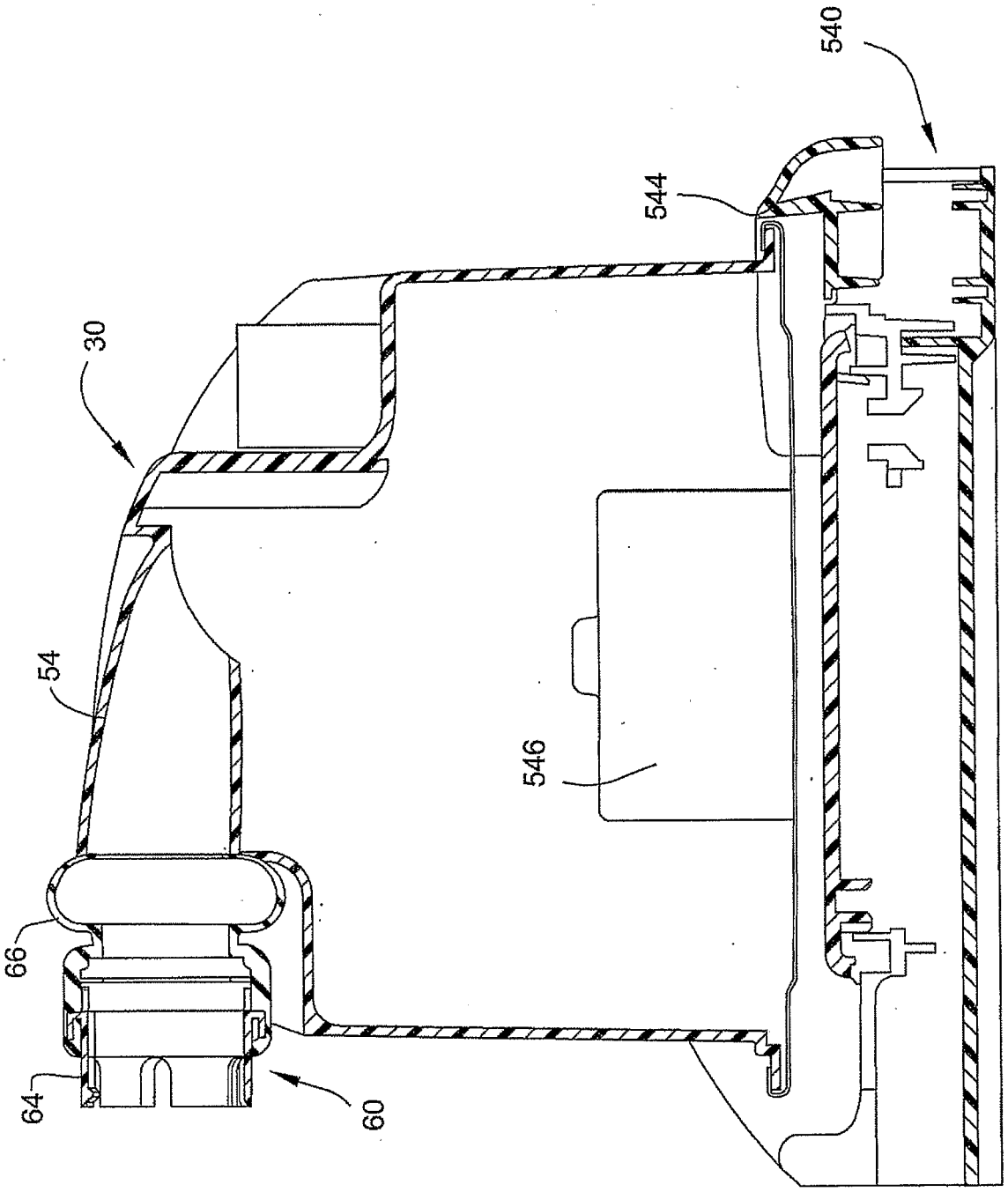


Fig. 6

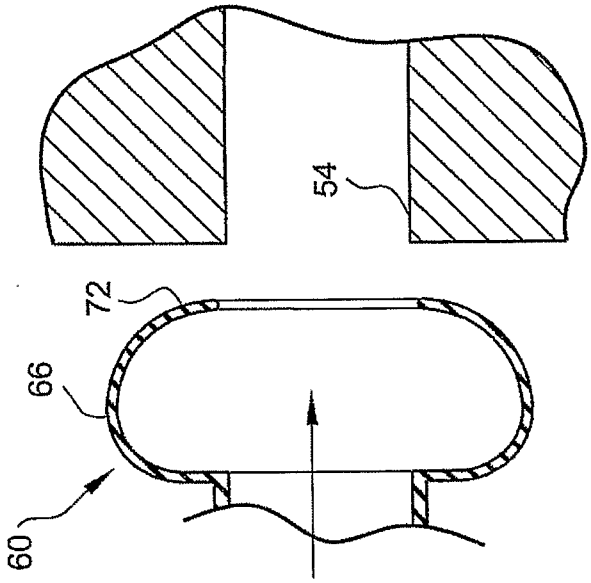


Fig. 7B

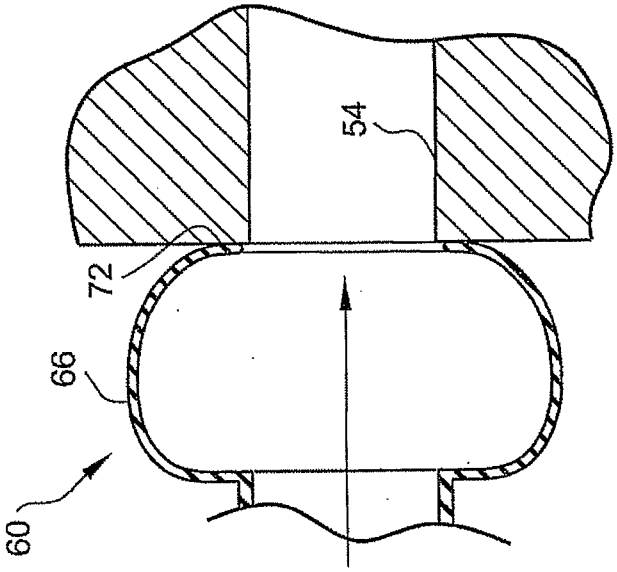


Fig. 7C

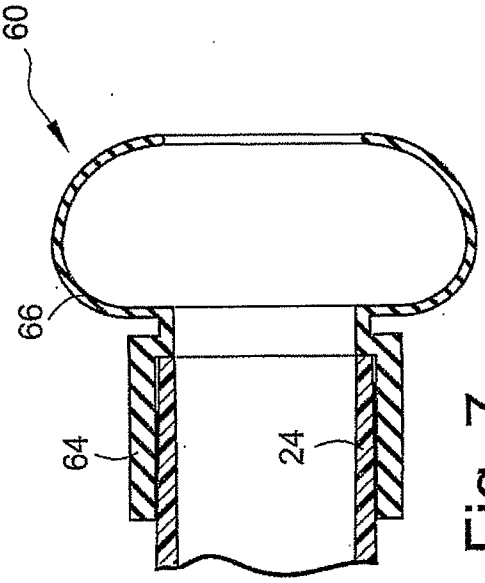


Fig. 7

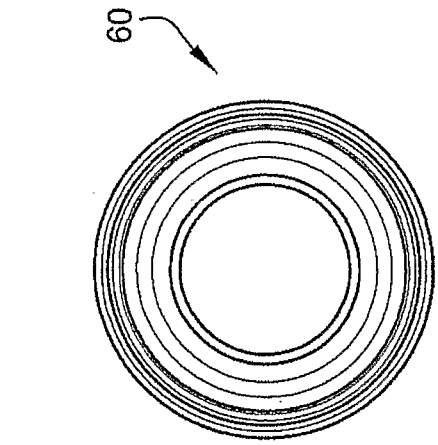


Fig. 8C

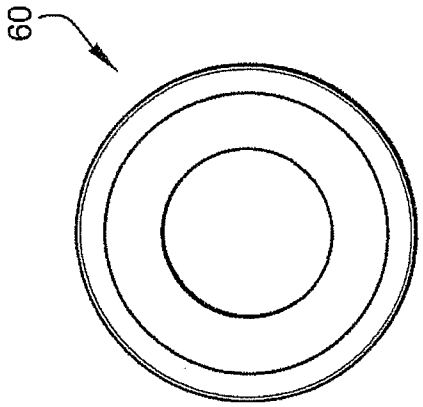


Fig. 8B

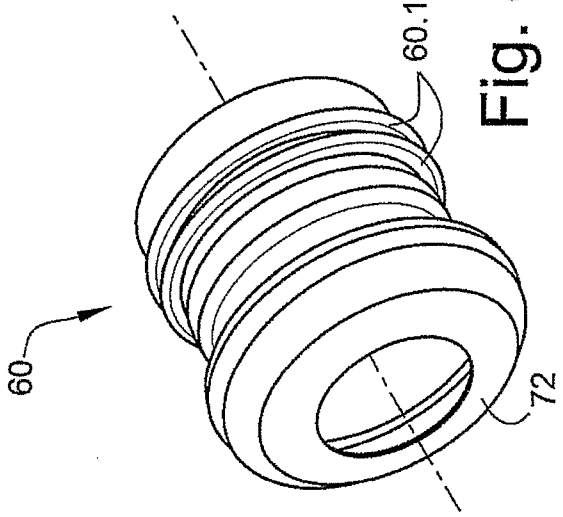


Fig. 8A

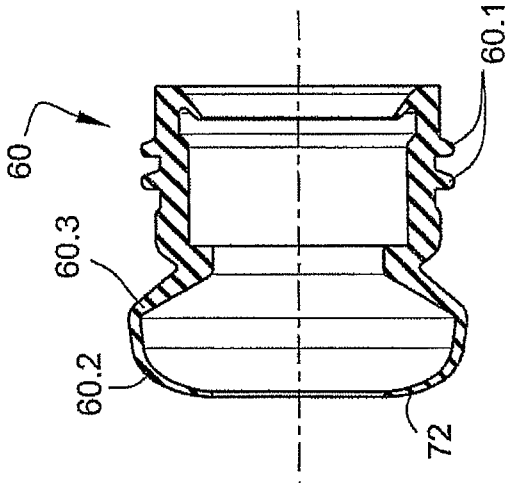


Fig. 8E

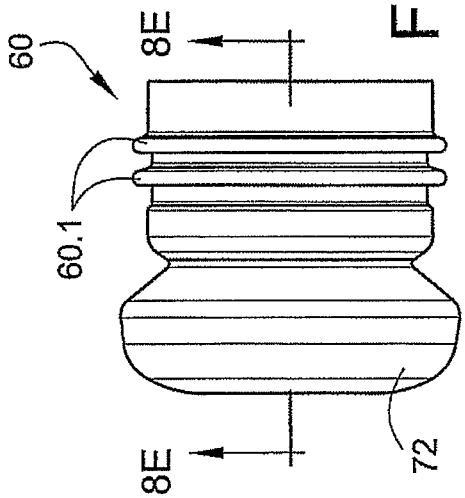


Fig. 8D

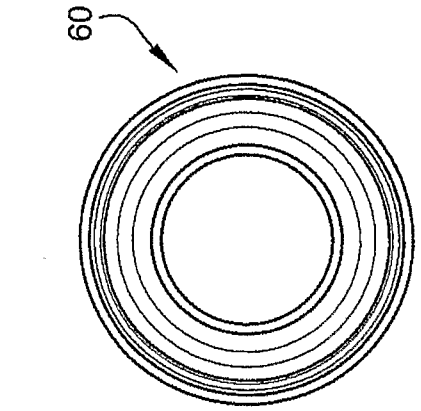


Fig. 9C

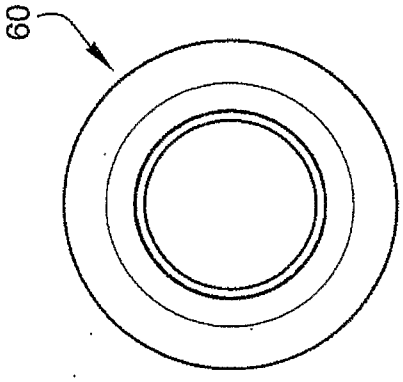


Fig. 9B

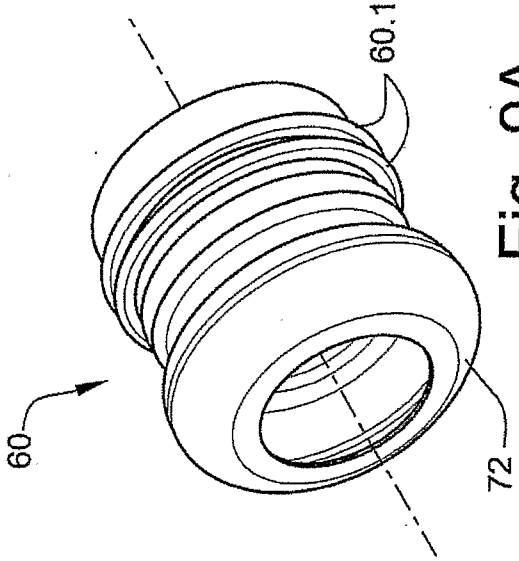


Fig. 9A

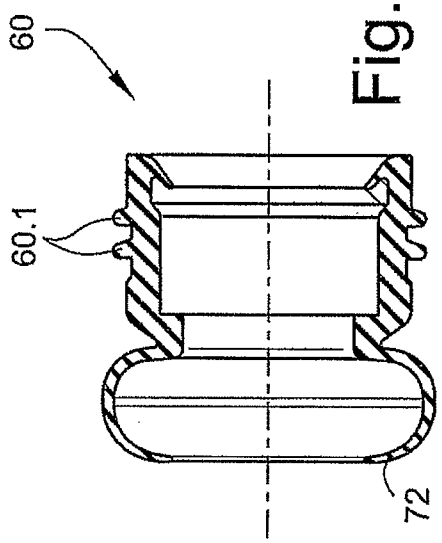


Fig. 9E

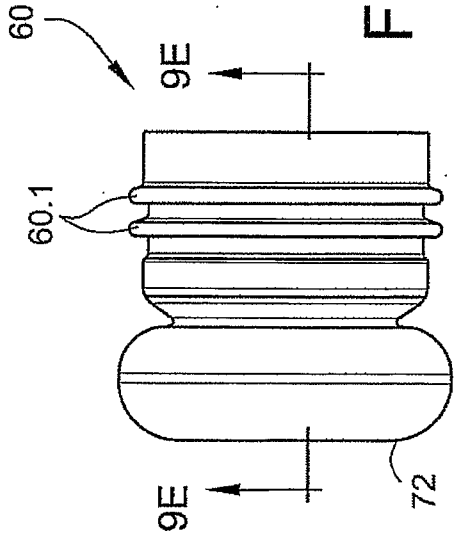


Fig. 9D

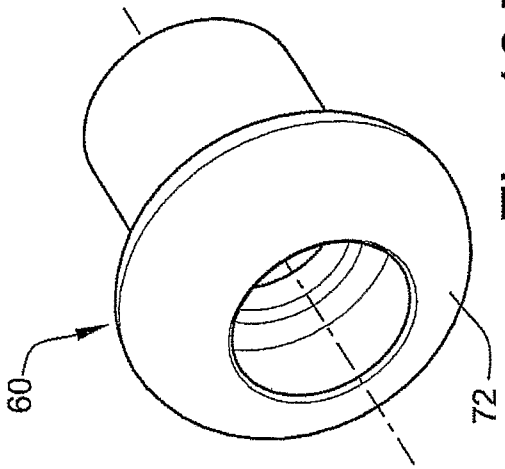


Fig. 10A

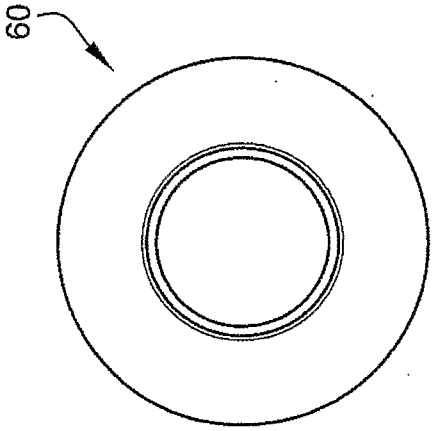


Fig. 10B

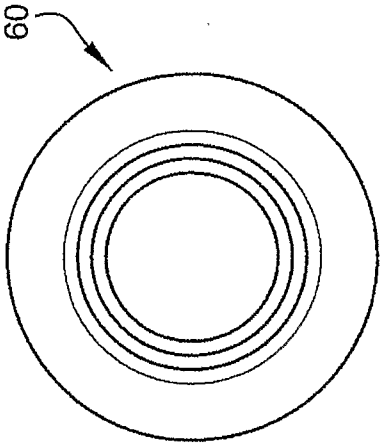


Fig. 10C

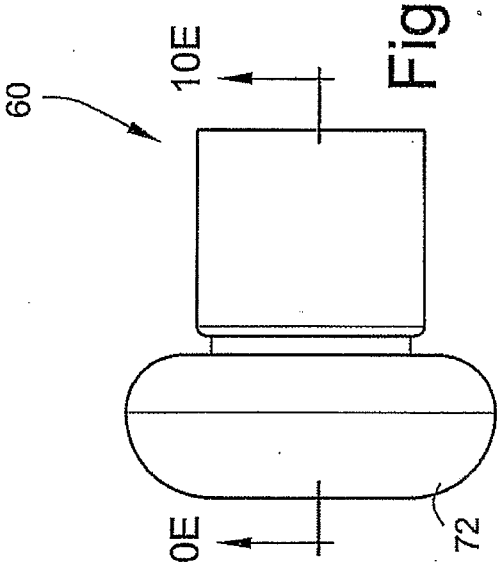
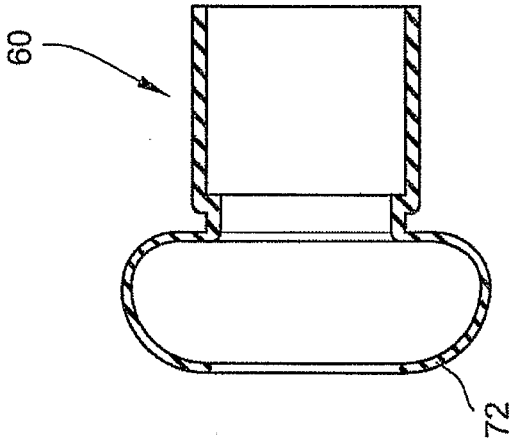


Fig. 10D



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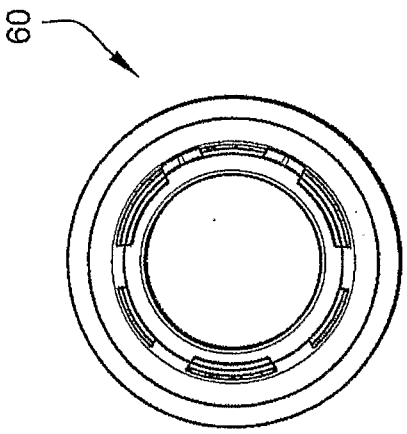

Fig. 11C

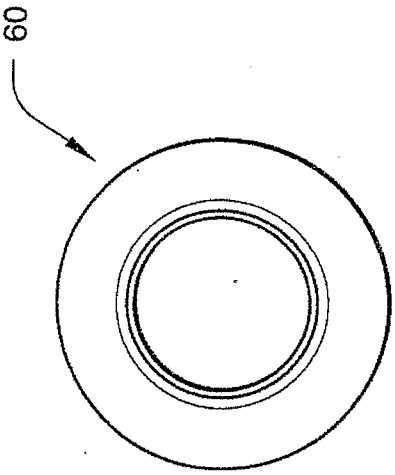

Fig. 11B

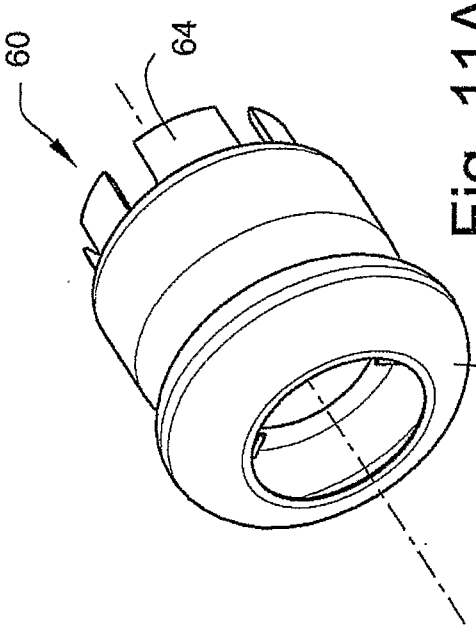

Fig. 11A

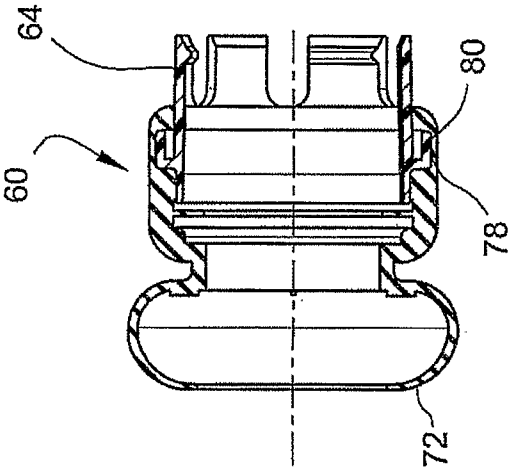

Fig. 11E

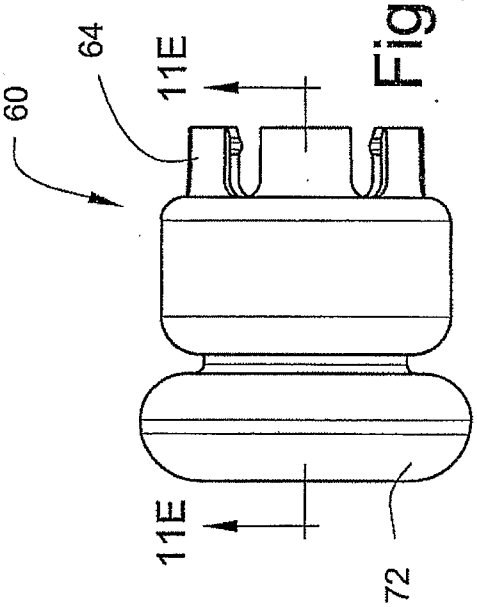

Fig. 11D

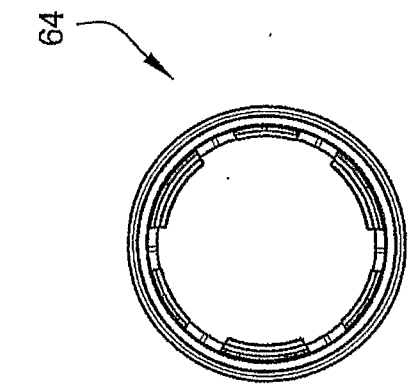

Fig. 12C

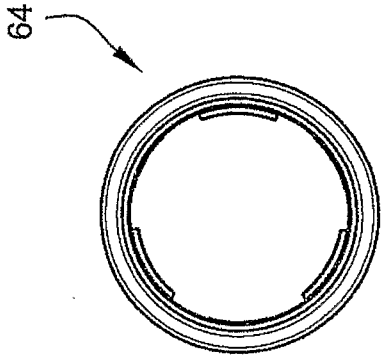

Fig. 12B

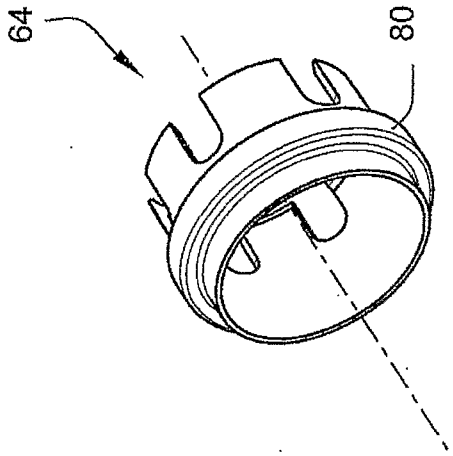

Fig. 12A

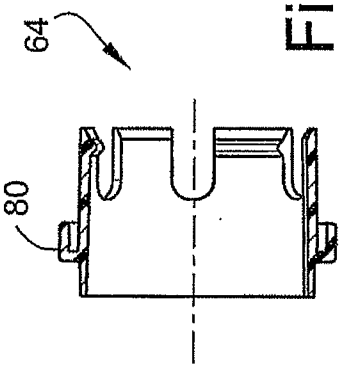

Fig. 12E

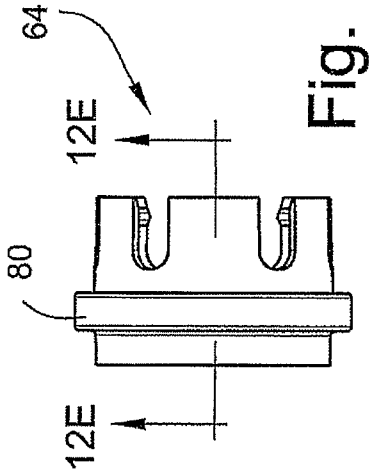

Fig. 12D

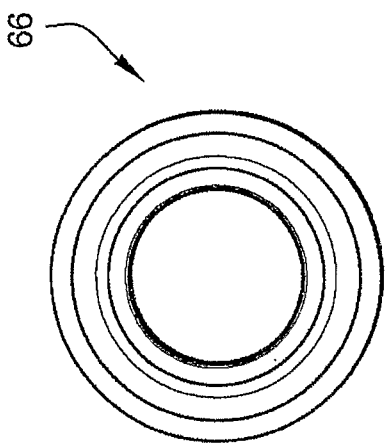

Fig. 13C

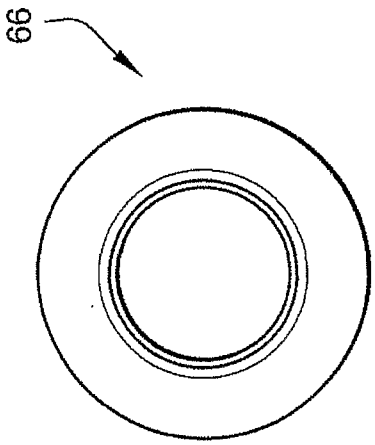

Fig. 13B

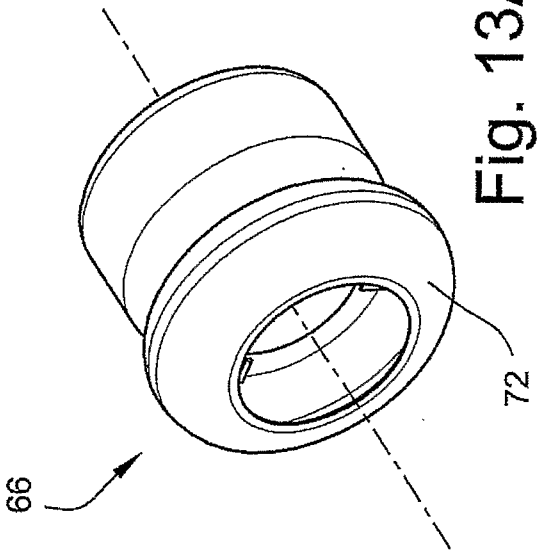

Fig. 13A

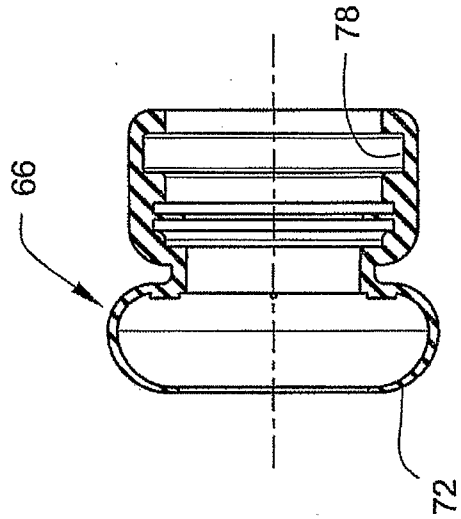

Fig. 13E

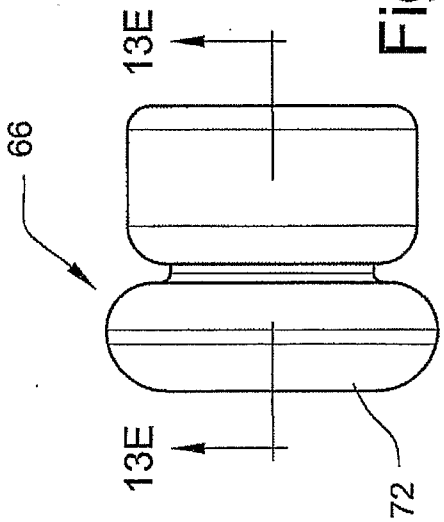

Fig. 13D

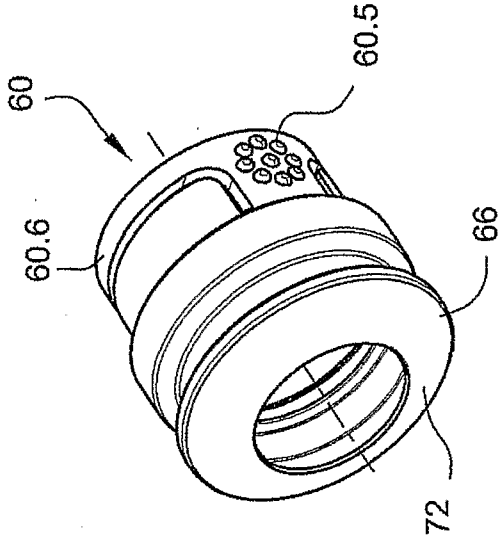

Fig. 14A

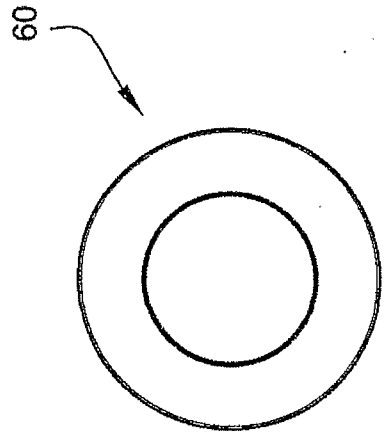

Fig. 14B

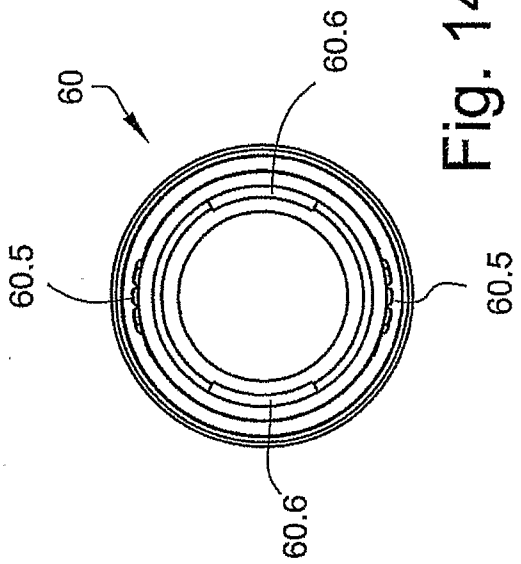

Fig. 14C

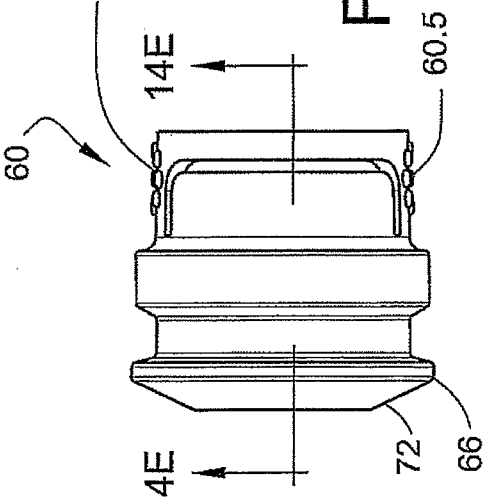

Fig. 14D

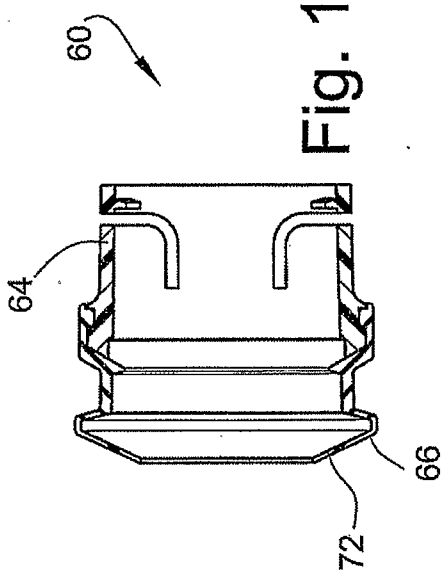

Fig. 14E

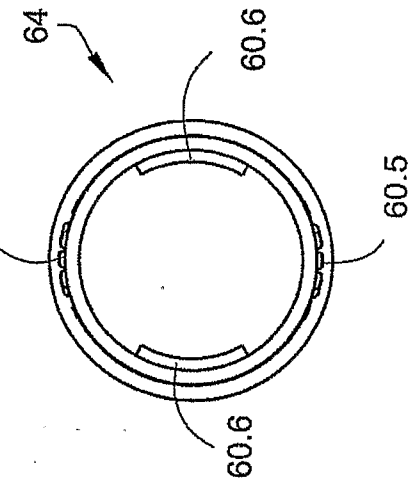

Fig. 15C

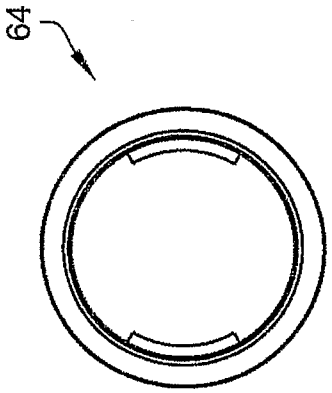

Fig. 15B

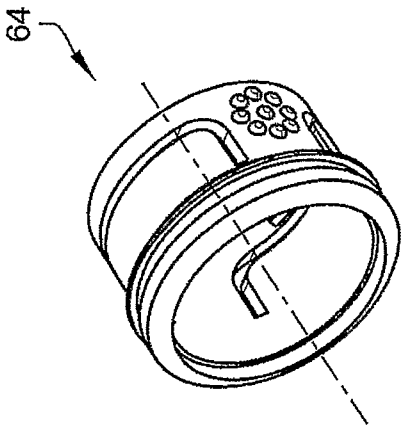

Fig. 15A

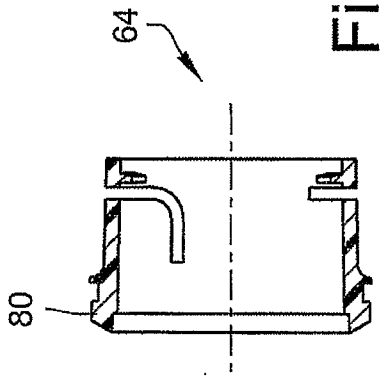

Fig. 15E

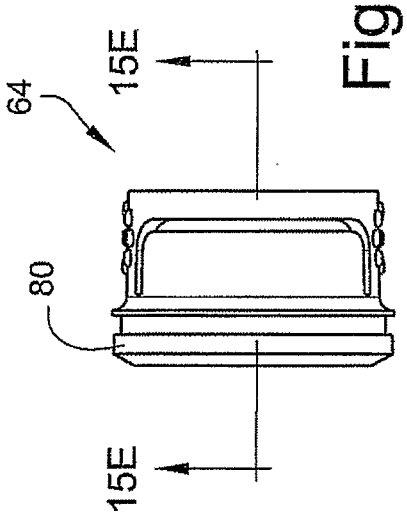

Fig. 15D

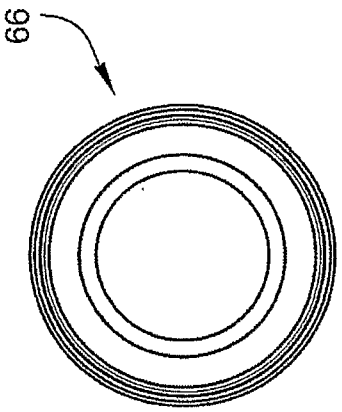

Fig. 16C

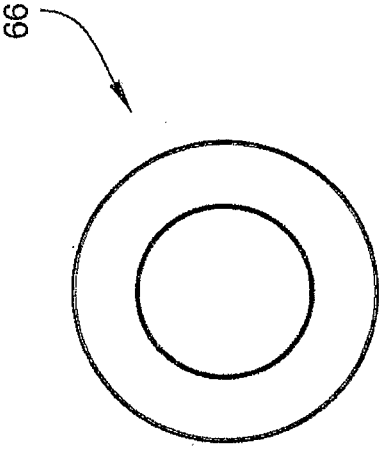

Fig. 16B

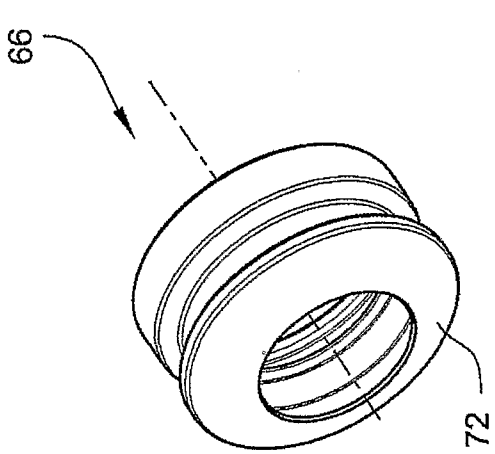

Fig. 16A

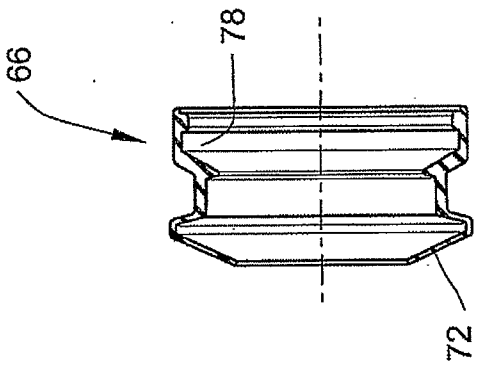

Fig. 16E

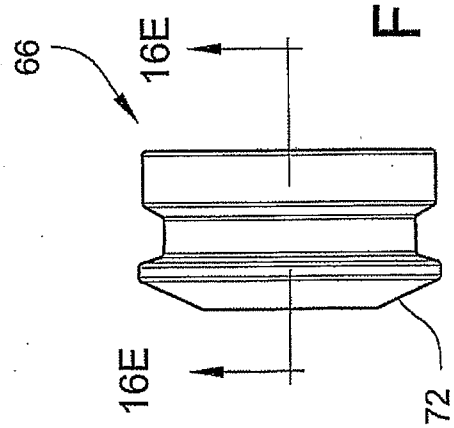

Fig. 16D

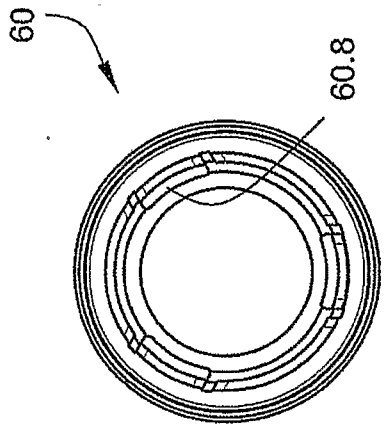

Fig. 17C

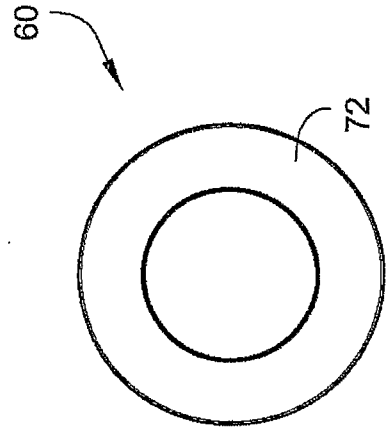

Fig. 17B

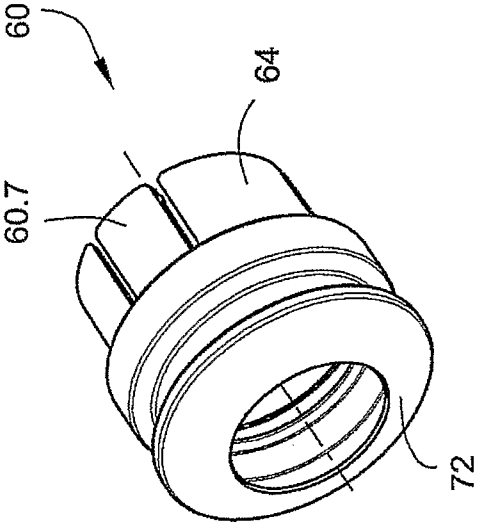

Fig. 17A

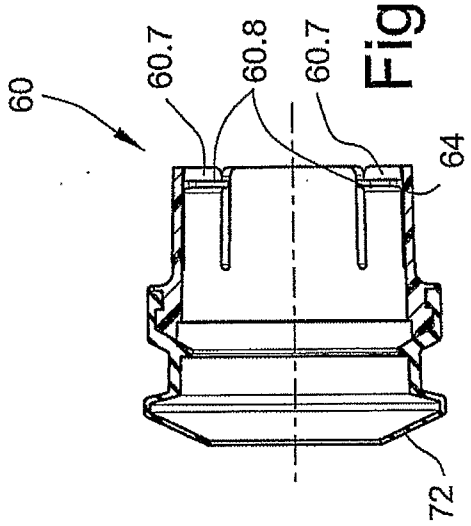

Fig. 17E

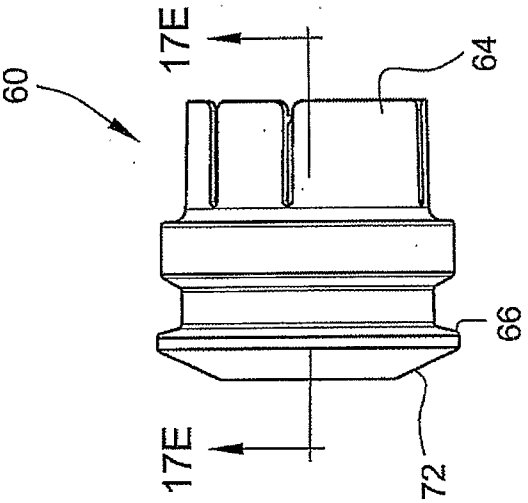

Fig. 17D

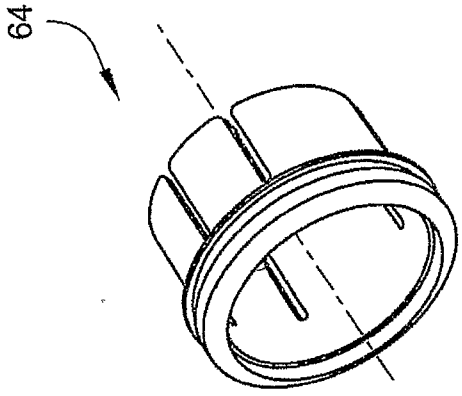

Fig. 18A

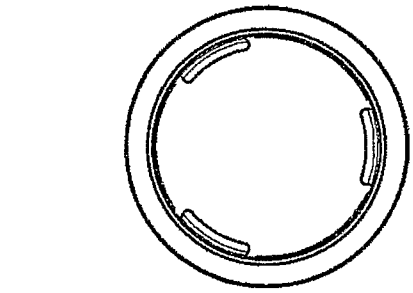

Fig. 18B

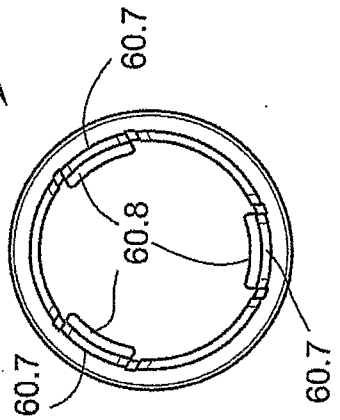

Fig. 18C

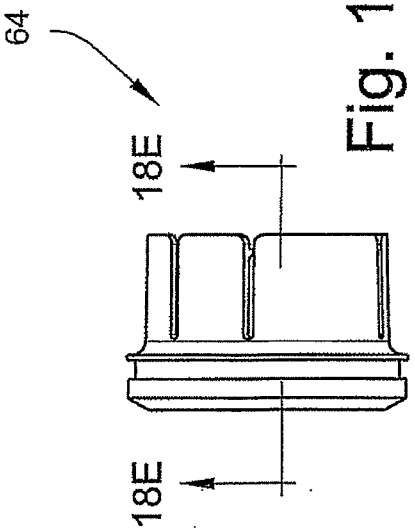

Fig. 18D

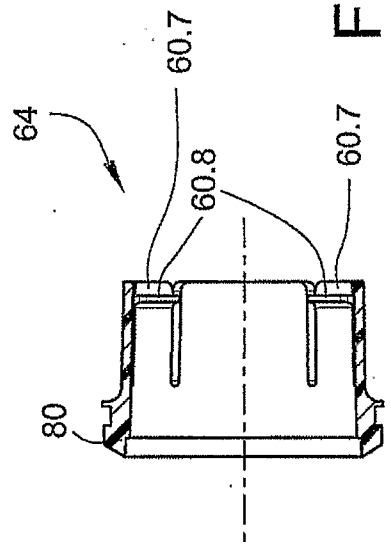

Fig. 18E

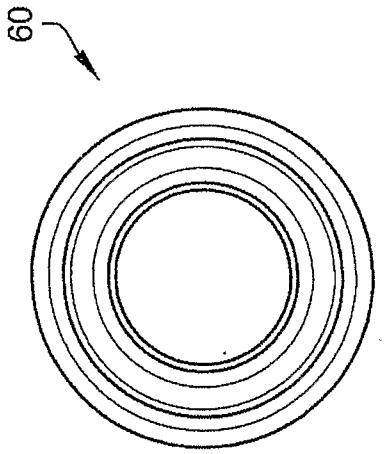

Fig. 19C

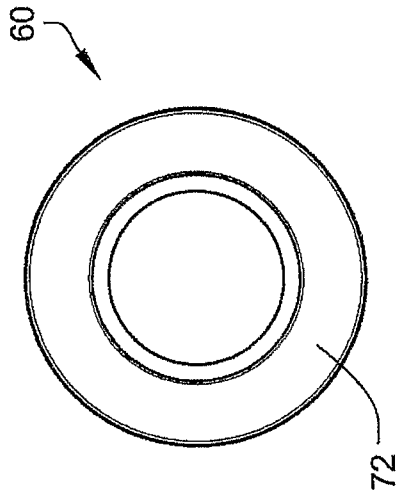

Fig. 19B

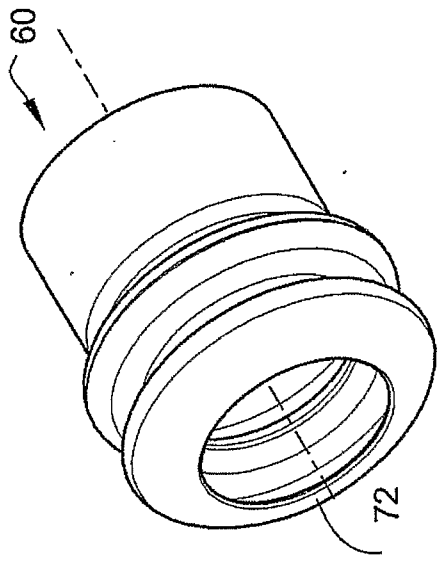

Fig. 19A

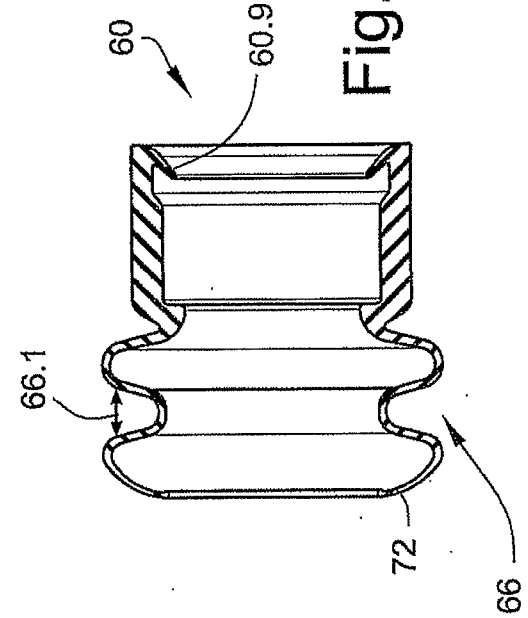

Fig. 19E

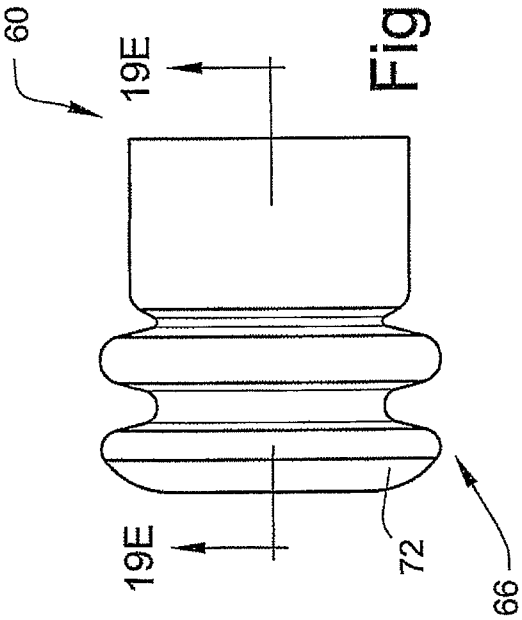

Fig. 19D

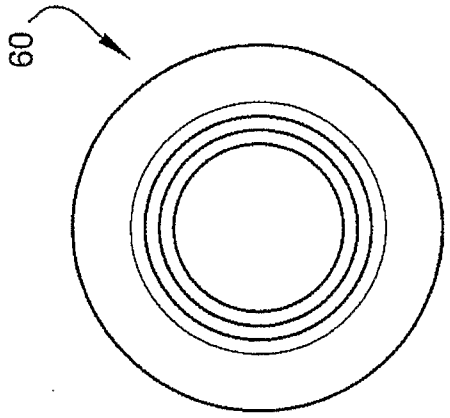

Fig. 20C

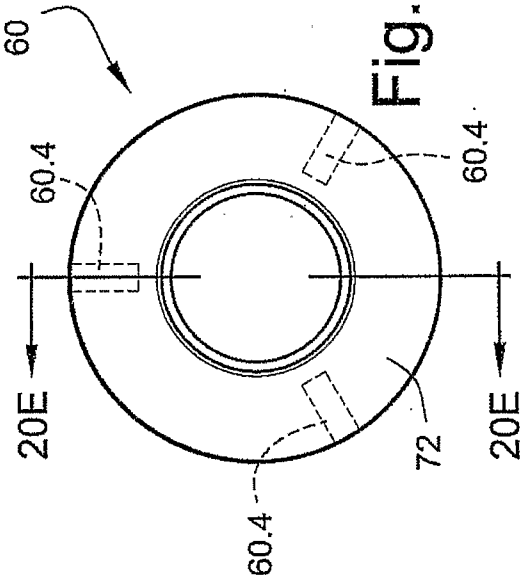

Fig. 20B

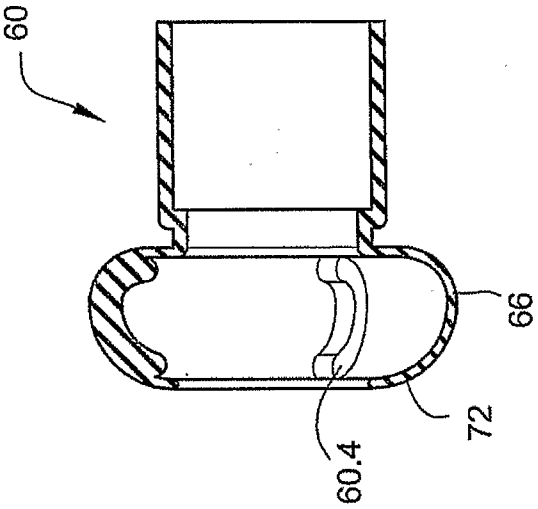

Fig. 20E

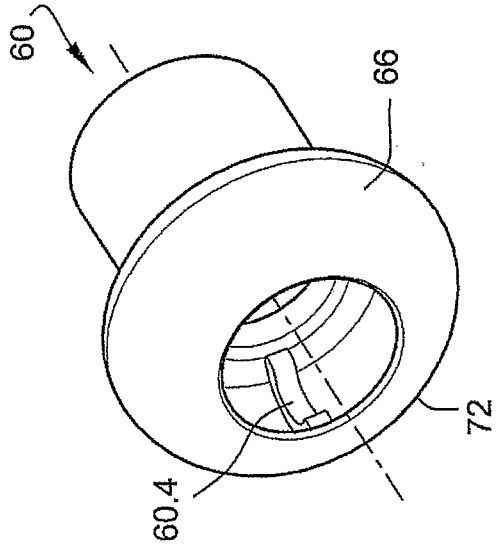

Fig. 20A

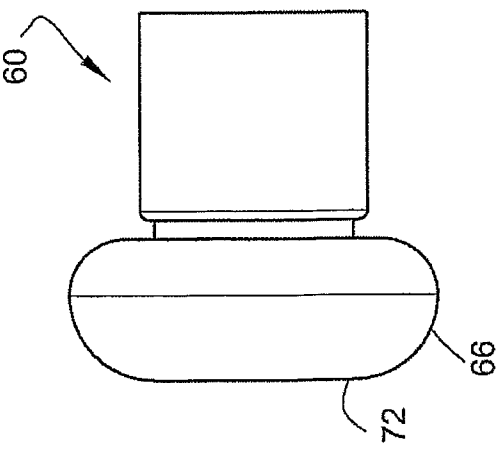

Fig. 20D

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2006/001172

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. ***A61M 16/08*** (2006.01) ***A62B 9/04*** (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)
DWPI - IPC A61M, A62B, F16L-037, F16L-047; & keywords (CPAP, OSA, apnea, apnoea, hypopnea, hyppnoea, BIP AP, VPAP, APAP adaptor, coupling, connector, flex+, soft, plia+, resili+, conform+, seal, +tight, bellows, inflat+, cushion*)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	U S 2004/0065335 A 1 (HUBER et al) 8 April 2004 See in particular figures 1 to 5	1 to 27 and 29
X	U S 5,349,946 A (McCOMB) 27 September 1994 See in particular figure 1 (item 18)	1 to 27 and 29
X	U S 5,673,687 A (DOBSON et al) 7 October 1997 See in particular column 1 lines 20 to 24	1 to 27 and 29

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 September 2006	18 SEP 2006

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2006/001172

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2,1 16,434 A (ENGSTROM MEDICAL AB) 28 September 1983 See in particular figure 1	1to 27 and 29
X	US 3,388,705 A (GROS SHANDLER) 18 June 1968 See in particular figures 1 and 2	1to 27 and 29
X	EP 0339234 Al (KLÖBER) 2 November 1989 See in particular figures 1 to 6	1to 27 and 29
A	US 6,81 1,546 Bl (CALLAS et al) 2 November 2004 See Entire Document	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2006/001172

This Annex lists the known "A" publication level 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 Cited in Search Report		Patent Family Member					
US	2004065335	AU	37392/01	DE	10007506	EP	1265666
		US	7086422	WO	0160439		
us	5349946						
us	5673687	US	5564415				
GB	2116434	JP	58192555	SE	8201131	US	4516573
US	3388705						
EP	0339234	DE	3904106	US	4953897		
US	6811546						

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

END OF ANNEX