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(54) **COUPLING ARRANGEMENT**

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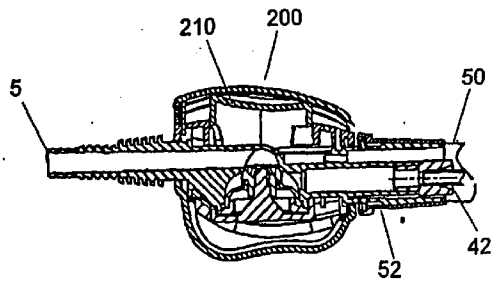
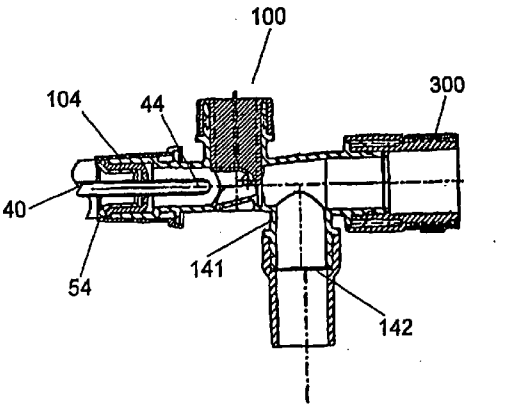
(57) **ABSTRACT**

The present invention relates to a coupling arrangement for a system for endotracheal ventilation of a patient, which system comprises an endotracheal tube and a manifold **(100)** configured for allowing ventilation of the patient via said endotracheal tube, which manifold **(100)** has a first coupling means **(300)** with an axial extent **(400)** and with engagement means **(330)**; and which endotracheal tube has a second coupling means **(400)** with an axial extent and with engagement means **(420)**; wherein the coupling arrangement is configured to produce, when the first **(300)** and the second **(400)** coupling means are moved together in the axial direction, a locking engagement between die engagement means **(33, 420)**. The invention is characterised in that the first coupling means **(300)**, in the axial direction, comprises an exterior screw thread **(320)**; and that the second coupling means **(400)** comprises an exterior abutment face **(430)**; that the coupling arrangement also comprises a disengagement means **(350)** configured for cooperating with said screw thread **(320)**; and that the disengagement means **(350)** and the screw thread **(320)** are configured for allowing an axial movement of the disengagement means **(350)** from a first position, in which said engagement means **(330, 420)** are in locking engagement, to a second position in which the disengagement means **(350)** can influence the abutment face **(430)** by an axial force for releasing the locking engagement.





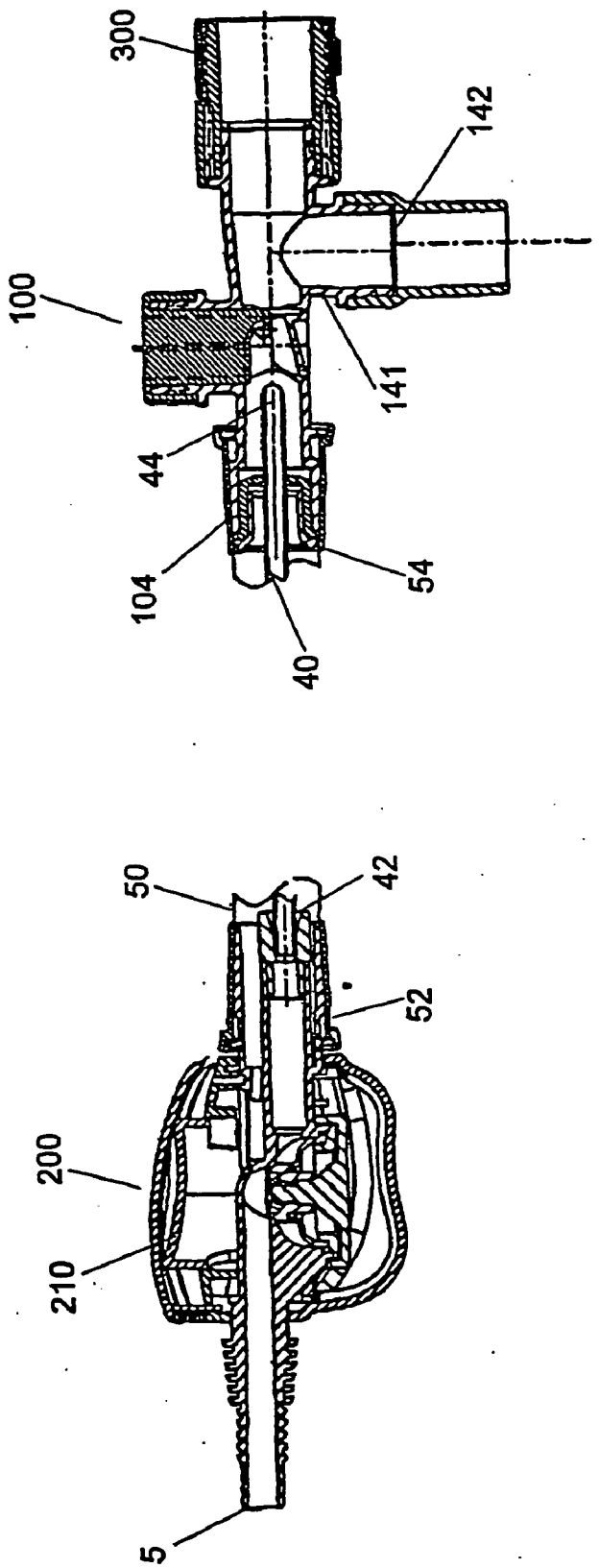


FIG. 1

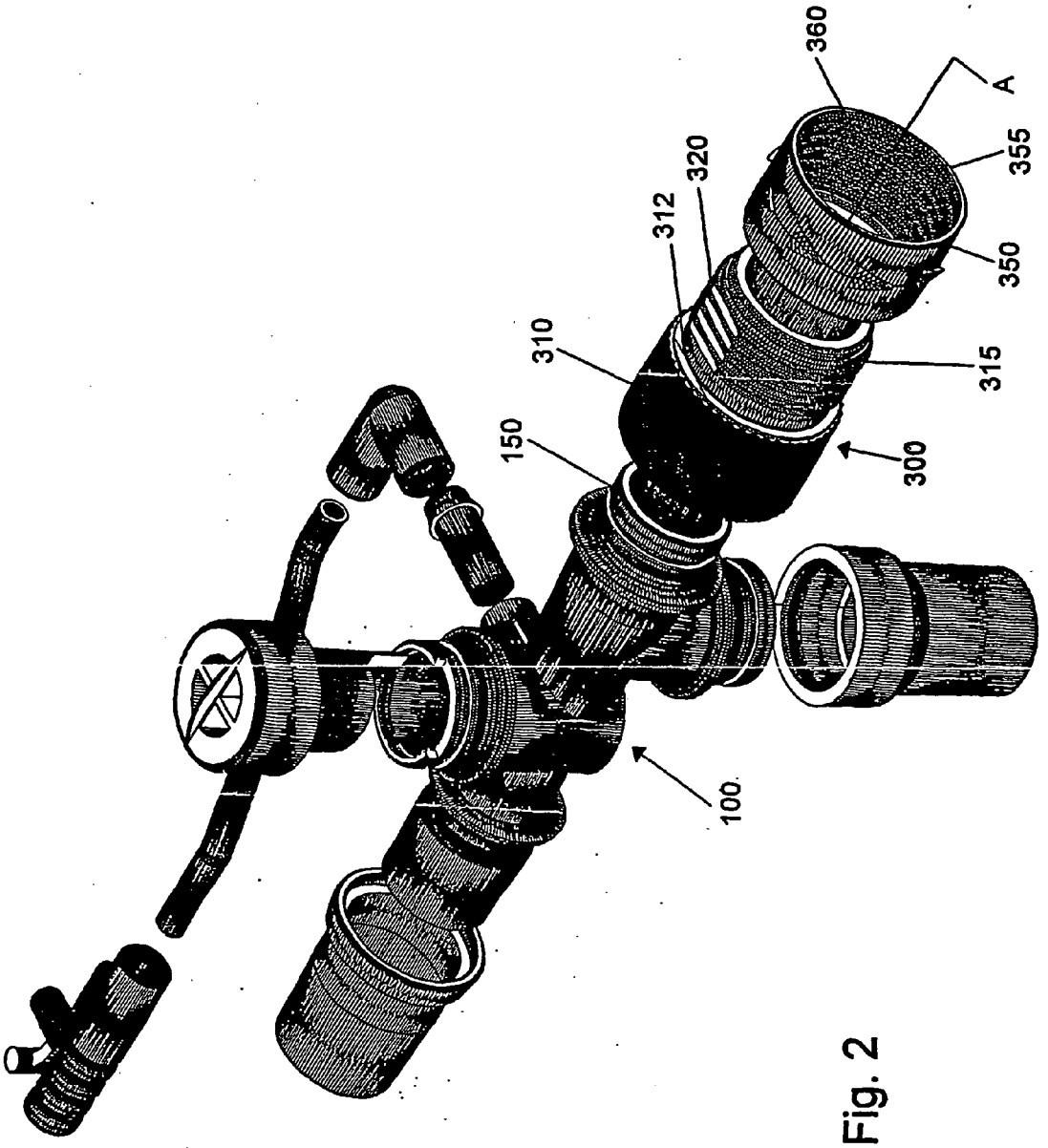


Fig. 2

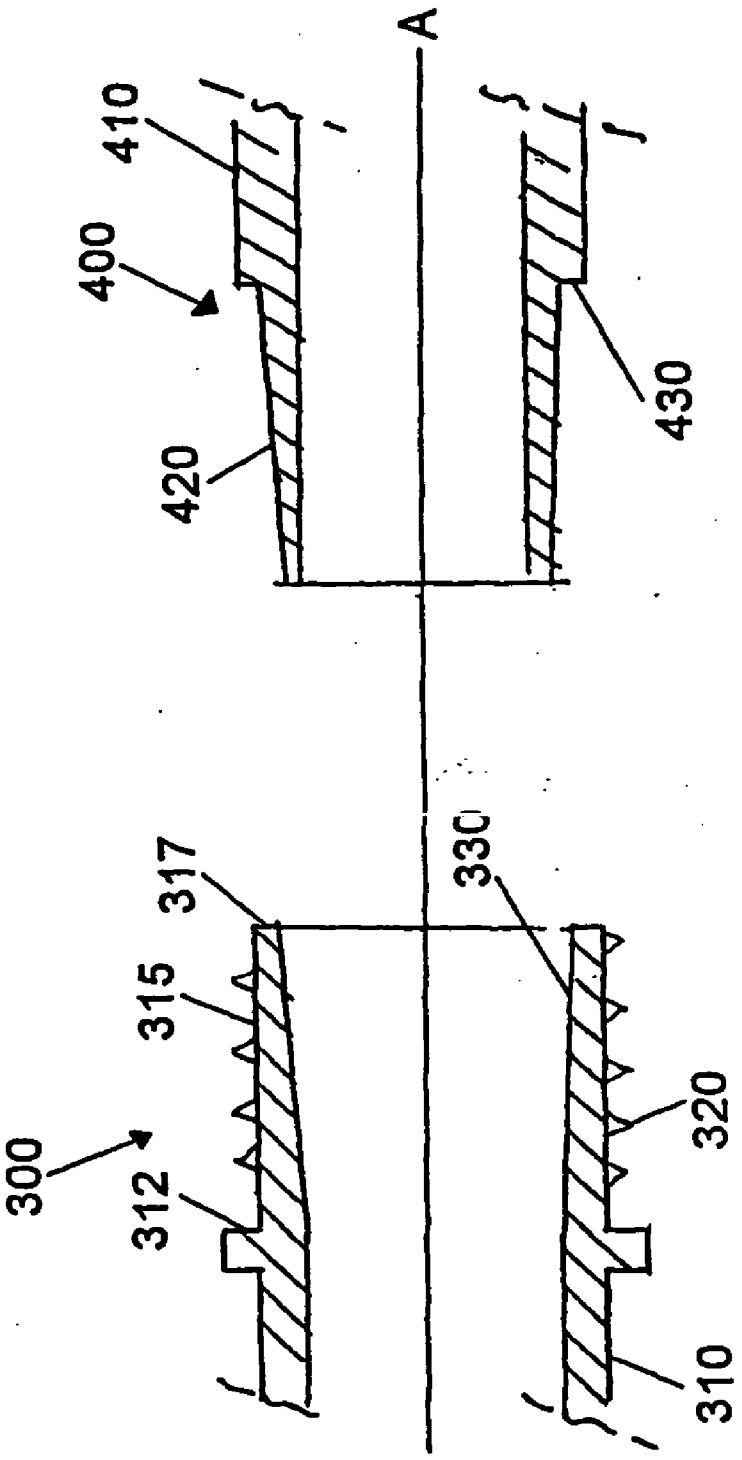


Fig. 3

COUPLING ARRANGEMENT

[0001] The present invention relates to a coupling arrangement of the kind described in the preamble to claims **1** and **2**. The coupling arrangement can be used for connecting a manifold of the kind described in eg WO98/33536 and U.S. Pat. No. 5,487,381 to an endotracheal tube.

[0002] It is commonly known to configure the end of an endotracheal tube with a conically tapering male coupling means that is introduced into a complementarily configured female coupling means on the manifold for establishing a sealing frictional connection. In order to separate the parts from each other it is necessary to produce an axial separation force. This force is typically produced by means of a disengagement means in the form of a wedge-shaped manifold that is wedged between two protruding flanges located at the end of the female and the male coupling means, respectively.

[0003] However, it has been found that by use of said manifold in practice, it is difficult for the hospital staff to avoid laterally oriented power influences on the coupling means and thus on the endotracheal tube that has been inserted into the patient with ensuing traumatic consequences for the patient. Besides, the prior art solutions involve a risk that the manifold disappears. In given situations, the latter has entailed that the hospital staff have attempted to separate the coupling means manually, which has, to an even wider extent, traumatically influenced the patient due to laterally oriented power influences.

[0004] It is the object of the invention to solve the above-mentioned problems by the prior art. As featured in the characterising portions of claims **1** and **2** this is obtained by arranging a thread for a disengagement means on either the manifold or in connection with the endotracheal tube. By the solution thus provided it is ensured that, at any time, the separation force is oriented essentially in the axial direction, and that no power influences occur transversally to the coupling means. Additionally, it becomes possible to avoid that the disengagement means is lost.

[0005] It is also preferred that the coupling means are configured as male and female parts, respectively, as featured in claims **3** and **4**. Preferably the coupling means are configured with engagement means in the form of complementary conical faces whereby it is possible to provide a frictional coupling in conventional manner as such. However, nothing prevents the engagement means from being configured in another manner, eg so as to provide a releasable joining by dipping together the engagement parts while profiting from the resilience of the constituent materials.

[0006] The invention will now be described in further detail with reference to the embodiments shown in the drawing. In the drawing:

[0007] **FIG. 1** illustrates a part of a system for endotracheal ventilation of a patient;

[0008] **FIG. 2** illustrates a manifold in a perspective view and featuring a part of the coupling arrangement according to the invention; and

[0009] **FIG. 3** is a cross sectional view through the coupling arrangement according to the invention, without the disengagement means.

[0010] In principle, the functionality of the system shown in **FIG. 1** corresponds to the functionality of eg the system described in DK patent application No 32/95. The system shown is thus suitable for performing ventilation as well as aspiration of a patient and is thus conventionally designated a 'closed' system. A flexible shrouding or pipe coupling **50** is thus, at its first end **52**, connected to the valve device **200** and it is, at its opposite end **54**, connected to a manifold **100**. The valve housing **200** is configured for being, via a coupling **5**, connected to a not shown suction device for generating a sub-atmospheric pressure in the system.

[0011] The manifold **100**, which is preferably transparent, is also configured to be connected—via a coupling arrangement—to a tubular element or "tube" for endotracheal ventilation of a patient, ie a tube configured for being introduced into the respiratory tracts of the patient with a view to maintaining artificial ventilation of the patient. To this end, the manifold **100** has a coupling device, designated in the drawing by the reference numeral **300** and to be described in further detail below. An opening **142** in a ventilation stub **141** allows ventilation of the patient by means of a not shown conventional apparatus. To this end the ventilation stub **141** is preferably configured with a screw thread for connection with the ventilation apparatus.

[0012] Besides, the system conventionally comprises a catheter **40** that extends within the interior of the shrouding **50** and that can be introduced into the patient's respiratory tracts to draw out secretion. At its first end **42**, the catheter **40** is securely connected to the valve device **200** and, at its opposite end **44**, it is displaceably received in the manifold **100**, the catheter being—via a packing **104**—sealed relative to the shrouding **50** so as to prevent fluid from penetrating into the shrouding. Also, the packing **104** causes secretion to be scraped off the outside of the catheter **40** during withdrawal of the catheter from the patient. It will be understood that the opposite end **44** of the catheter forms a suction point that can, while the shrouding **50** is simultaneously folded, be displaced through the manifold interior and into the not shown tube for ventilation of the patient. By this movement, the end **44** of the catheter is thus conveyed to the right in **FIG. 1**. Hereby it is possible to perform regular suction of secretion from the patient's respiratory tracts, as the operator connects the system to the suction device by operating an actuator button **210** arranged in the valve housing **200**.

[0013] As mentioned above, the manifold **100** has a coupling device that constitutes a first coupling means **300** of a coupling arrangement **300**, **330**, **400**. This first coupling means is shown more clearly in **FIG. 2**, from where it will also appear that the manifold **100** defines a through-going axis A. In the embodiment shown the coupling means **300** is constituted by a separate pipe coupling that is configured for being able to be fastened in extension of the manifold **100** via an engagement area **150** on the outside of the manifold **100** and that extends along the axis A. However, the coupling means **300** may very well be formed integrally with the manifold **100**. The coupling means **300** has an interiorly extending, through-going passage for ventilation and aspiration of the patient, and it has at its one end a first cylindrical area **310** that continues—via an annular plateau **312** that extends perpendicular to the axis A—into a cylindrical area **315** provided with an exterior thread **320**.

[0014] In **FIG. 3**, the coupling arrangement is shown in further detail. To the left in the drawing the coupling means

300 thus shown that has, to the extreme right, an annular end edge 317. The passage in the cylindrical area 315 has, as will appear, an evenly increasing interior diameter in a direction away from the manifold 100, whereby it is possible to provide a frictional joint between the first coupling means 300 and a second coupling means 400, which is shown to the right in FIG. 3, and comprising an area 420 that is complementary with the area 315.

[0015] The second coupling means 400 is, as shown, configured as a cylindrical body with a through-going passage that extends along the axis A like the passage in the first coupling means 300. A tapering area 420 of the second coupling means 400 has an increasing, exterior diameter that has been adjusted in accordance with the change in the interior diameter of the passage within the area 315 in the first coupling means 300. Thereby it is possible to provide a sealing frictional coupling by introduction of the second coupling means 400 into the first coupling means 300. When the manifold 100 is to be connected to an endotracheal tube, said joining of the two coupling means is performed for establishing a very sealing frictional connection. The tapering of the passage within the area 315 and the area 420 can be comprised within the preferred ratio of about 1 to 40.

[0016] The second coupling means 400 also comprises a plateau 430 that extends perpendicular to the axis A, which plateau forms a transition between the tapering area 420 and a head portion 410 of the coupling means 400. The head portion 410 can either be solidly connected to the end of an endotracheal tube, or it can be configured for being solidly connected to the end of an endotracheal tube immediately preceding the introduction into the patient of the endotracheal tube. It will be understood that the first coupling means 300 will, in the relevant case, form a female coupling means, whereas the second coupling means 400 forms a male coupling means.

[0017] Additionally the coupling arrangement comprises the disengagement means 350 shown in FIG. 2 that has an internal thread 360 configured for cooperating with the thread 320. The plateau 312 forms a first end position for the disengagement means 350, since preferably the extent of the disengagement means 350 along the axis A corresponds maximally to the extent of the thread 320 along the axis A.

[0018] When the second coupling means 400 has been introduced into the coupling means 300, the end edge 317 is preferably in abutment on the plateau 430. In this state, there will preferably be a certain distance between the plateau 430 and the disengagement means 350 that has been screwed onto the area 315. In order to be able, in this state, to perform a separation of the two coupling means, the disengagement means 350 is turned a suitable number of times, whereby the means 350 is displaced and caused to abut on the plateau 430. By carrying out a further manual turning of the disengagement means 350, an axial power influence is generated towards the second coupling means 400. The power influence is oriented in accordance with the axis A and will entail that the second coupling means 400 is released. The pitch of the threads 320, 360 can be selected in accordance with the forces involved, including the ease with which the user must be able to turn the disengagement means 350 in order to achieve the intended separation.

1-5. (Canceled).

6. An adaptor for connecting a closed suction catheter system to an artificial airway tube, said adaptor comprising a housing defining an internal chamber and having a distal end configured to detachably engage a proximal end of said artificial airway tube, and a proximal end configured for communication with a distal end of said closed suction catheter system;

said housing further comprising radially inwardly directed internal structure defining an air access between said housing and the artificial airway tube for air to be inhaled and exhaled by a patient breathing through an artificial airway having said adaptor attached thereto.

7. The adaptor according to claim 6, wherein said housing further comprises an oxygen port.

8. The adaptor according to claim 6, wherein said housing further comprises a ventilation port.

9. The adaptor according to claim 6, further comprising a release assembly configured with said housing, upon actuation thereof said release assembly separating said housing from said artificial airway tube.

10. The adaptor according to claim 6, further comprising a disengagement member configured with said housing, upon actuation thereof said disengagement member separating said housing from said artificial airway tube.

11. The adaptor according to claim 6, wherein said proximal end of said housing is engageable with said closed suction catheter system.

12. The adaptor according to claim 6, wherein said proximal end of said housing is detachably engageable with said closed suction catheter system.

13. The adaptor according to claim 6, wherein said proximal end of said housing is non-removably fixed to said closed suction catheter system.

14. An adaptor for connecting a closed suction catheter system to an artificial airway tube, said adaptor comprising a housing defining an internal chamber and having a distal end configured to detachably engage a proximal end of said artificial airway tube, and a proximal end configured for communication with a distal end of said closed suction catheter system; said housing further comprising internal structure defining an air access for air to be inhaled and exhaled by a patient breathing through an artificial airway having said adaptor attached thereto;

said adaptor further comprising a release assembly configured with said housing, upon actuation thereof said release assembly separating said housing from said artificial airway tube; and

wherein the release assembly comprises a release member disposed at said distal end of said adaptor, said release member movable distally upon actuation of said release assembly to disengage said housing from said artificial airway tube.

15. An adaptor for connecting a closed suction catheter system to an artificial airway, said adaptor comprising:

a housing defining an internal chamber and having a distal end configured to detachably engage a proximal end of said artificial airway tube, and a proximal end configured for communication with a distal end of said closed suction catheter assembly; and

a release assembly configured on said housing to separate said housing from the artificial airway upon actuation of said release assembly.

16. An adaptor for connecting a closed suction catheter system to an artificial airway, said adaptor comprising:

a housing defining an internal chamber and having a distal end configured to detachably engage a proximal end of said artificial airway tube, and a proximal end configured for communication with a distal end of said closed suction catheter assembly;

a release assembly configured on said housing to separate said housing from the artificial airway upon actuation of said release assembly; and

wherein said release assembly comprises a release member disposed at said distal end of said adaptor, said release member movable distally upon actuation of said release assembly to disengage said housing from said artificial airway tube.

17. The adaptor according to claim 16, wherein said release assembly consists of a release member disposed at the distal end of the adaptor and which may be extended distally to disengage the housing from the artificial airway tube.

18. An adaptor for connecting a closed suction catheter system to an artificial airway, said adaptor comprising:

a housing defining an internal chamber and having a distal end configured to detachably engage a proximal end of said artificial airway tube, and a proximal end configured for communication with a distal end of said closed suction catheter assembly;

a release assembly configured on said housing to separate said housing from the artificial airway upon actuation of said release assembly; and

wherein said adaptor housing includes a manifold having a first barrel, a second barrel, and a third barrel, said first and second barrels being substantially in alignment and said third barrel extending perpendicularly thereto.

19. The adaptor according to claim 18, wherein said manifold further contains a fourth barrel.

20. An adaptor for connecting a closed suction catheter system to an artificial airway, said adaptor comprising:

a housing defining an internal chamber and having a distal end configured to detachably engage a proximal end of said artificial airway tube, and a proximal end configured for communication with a distal end of said closed suction catheter assembly;

a release assembly configured on said housing to separate said housing from the artificial airway upon actuation of said release assembly; and

wherein said adaptor housing includes a manifold having a first cylinder, a second cylinder, and a third cylinder, said first and second cylinders being substantially in alignment and said third cylinder extending perpendicularly thereto.

21. The adaptor according to claim 20, wherein said manifold further contains a fourth cylinder.

22. A catheter system comprising:

a closed suction catheter assembly;

an adaptor for connecting said closed suction catheter system to an artificial airway tube, said adaptor comprising a housing defining an internal chamber and having a distal end configured to detachably engage a proximal end of said artificial airway tube, and a proximal end in communication with a distal end of said closed suction catheter assembly; said housing further comprising radially inwardly directed internal structure defining an air access between said housing and the artificial airway tube for air to be inhaled and exhaled by a patient breathing through an artificial airway having said adaptor attached thereto.

23. A catheter system comprising:

a closed suction catheter assembly;

an adaptor for connecting said closed suction catheter assembly to an artificial airway, said adaptor comprising:

a housing defining an internal chamber and having a distal end configured to detachably engage a proximal end of an artificial airway tube, and a proximal end configured in communication with a distal end of said closed suction catheter assembly; and

a release assembly configured on said housing to separate said housing from the artificial airway upon actuation of said release assembly.

24. An apparatus for suctioning secretions from a patient intubated with a tracheostomy tube comprising:

a closed suction catheter assembly having a catheter tube, an envelope and a coupling for holding an end of the envelope; and

an adaptor disposed at the distal end of the closed suction catheter assembly and having a housing configured for attachment to an tracheostomy tube and a release assembly disposed adjacent the housing, the release assembly being configured for detaching the housing from the tracheostomy tube responsive to a compressive force to the release assembly.

25. An apparatus for suctioning secretions from a patient intubated with a tracheostomy tube comprising:

a closed suction catheter assembly having a catheter tube, an envelope and a coupling for holding an end of the envelope; and

an adaptor disposed at the distal end of the closed suction catheter assembly and having a housing configured for attachment to an tracheostomy tube and a release assembly disposed adjacent the housing, the release assembly being configured for detaching the housing from the tracheostomy tube responsive to a force to the release assembly.

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