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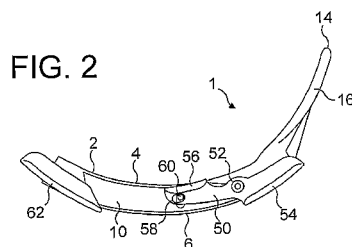
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(54) **Title:** LARYNGOSCOPE INSERTION SECTION WITH TUBE GUIDE



(57) **Abstract:** A laryngoscope insertion section includes an elongate member and a tube guide having a moveable guiding member, located transversely of the elongate member and moveable relative to adjacent elongate member to adjust the path of a retained endotracheal tube, thereby facilitating intubation.

1 Laryngoscope Insertion Section With Tube Guide

2

3 Field of the invention

4

5 The present invention relates to the field of laryngoscope insertion sections having
6 tube guides for detachably retaining and guiding endotracheal tubes during
7 intubation.

8

9 Background to the invention

10

11 Laryngoscopes are medical devices which are employed to introduce endotracheal
12 tubes into patient's airways, for example, when a patient is being anaesthetised.
13 Laryngoscopes comprise insertion sections, which are the part of a laryngoscope
14 which extends towards and into a patient's oral cavity during intubation. Insertion
15 sections may be removably attachable to a laryngoscope body, integral parts of
16 laryngoscopes or themselves function as laryngoscopes. As well as an insertion
17 section, laryngoscopes typically comprises a handle which is usually elongate and
18 which may be arranged at an angle to the proximal end of the insertion section or
19 generally parallel to the proximal end of the insertion section, or at any angle
20 therebetween. Laryngoscopes further include a source of light and a number of
21 known devices, referred to as video laryngoscopes, include imaging devices, for
22 example integral video cameras or fibre-optic bundles for attachment to external
23 video cameras, to enable a user to view the distal tip of an endotracheal tube as it is
24 being introduced into a patient's larynx.

1

2 Traditional laryngoscope insertion sections, such as insertion sections known in the
3 art as Miller, Macintosh or Wisconsin blades, function to lift a patient's tissue adjacent
4 the epiglottis to enable a tube to be inserted into a patient's larynx and to enable the
5 patient's larynx to be viewed during intubation. However, they do not guide tubes as
6 such.

7

8 A number of designs are known which do include a tube guide. For example, WO
9 04/073510 (Gandarias) discloses a laryngoscope having a lateral tube guide
10 extending along the majority of the length of the insertion section. A tube guide
11 enables an endotracheal tube to be detachably retained by the insertion section while
12 it is introduced into a patient's larynx. In principal, the provision of a tube guide may
13 facilitate intubation by introducing the endotracheal tube into the oral cavity at the
14 same time as the insertion section and by directing a tube towards the larynx.
15 However, a difficulty with known tube guides is that when an insertion section is
16 introduced into the correct position to expose the larynx, the tube guide may not be
17 arranged to direct a tube into the larynx as it is advanced through the tube guide.
18 Furthermore, tube guides increase the overall bulk of insertion sections.

19

20 It has been proposed to provide a hinge in an insertion section to enable to
21 longitudinally adjacent sections to pivot relative to each other around a lateral axis.
22 However, this does not significantly facilitate intubation using a tube guide which is
23 integral to the insertion section, particularly in difficult cases (referred to in the art as
24 Grade 3 or Grade 4 intubations) where the larynx is not readily exposed and visible.

25

26 Thus, the invention aims to provide laryngoscopes and laryngoscope insertion
27 sections which facilitate the introduction of an endotracheal tube into a patient's
28 larynx.

29

30 Summary of the invention

31

32 According to a first aspect of the present invention there is provided a laryngoscope
33 insertion section having a proximal end and a distal end for insertion into a patient's
34 oral cavity, the insertion section comprising a tube guide for retaining an endotracheal
35 tube and guiding a retained endotracheal tube towards a patient's larynx, wherein the
36 insertion section comprises an elongate support member and the tube guide
37 comprises a moveable tube guiding member which is positioned transversely of the

1 elongate support member and moveable relative to the elongate support member
2 adjacent the moveable tube guiding member.

3

4 By 'positioned transversely of' we include the possibility that the moveable tube
5 guiding member is mounted transversely of the insertion section, spaced apart from
6 the surface of the moveable tube guiding member or formed in a transverse (e.g.
7 superior, inferior or lateral) surface of the insertion section.

8

9 The moveable tube guiding member may be positioned inferiorly or superiorly of the
10 elongate support member (and thereby positioned transversely of the moveable tube
11 guiding member). Within this specification and the appended claims, the inferior
12 surface is the surface of an insertion section which faces the patient's tongue in use.
13 The opposite surface is referred to as the superior surface. Words such as inferior,
14 inferiorly, superior and superiorly are used in corresponding senses. A superior-
15 inferior axis is a virtual axis extending parallel to the superior and inferior directions.

16

17 The moveable tube guiding member may be positioned laterally of the insertion
18 section (and thereby positioned transversely of the insertion section). For example, it
19 may extend from the adjacent insertion section generally orthogonally to both the
20 length of the insertion section and the superior-inferior axis.

21

22 The insertion section has a distal end. The tube guide, including the tube guiding
23 member, defines at least in part a distal tube path along which a detachably retained
24 endotracheal tube which has been advanced sufficiently far in a distal direction
25 extends from the distal end of the insertion section towards a patient's larynx during
26 intubation. Typically also, the tube guide, including the tube guiding member,
27 defines, at least in part, a proximal tube path along which a detachably retained
28 endotracheal tube is guided along at least the majority of the length of the insertion
29 section.

30

31 Typically, the distal tube path defined at least in part by the tube guide will be slightly
32 different for endotracheal tubes of different configuration, for example, of different
33 external diameter. Thus, the distal tube path, and proximal tube path where relevant,
34 and typically specific to endotracheal tubes of predetermined configuration (e.g.
35 predetermined external diameter).

36

1 The distal tube path, and proximal tube path where relevant, may also be defined in
2 part by the actions of a user, for example, by the orientation at which a user feeds an
3 endotracheal into the insertion section tube guide, or the orientation at which a user
4 holds an endotracheal tube relative to the proximal end of the insertion section.

5

6 Preferably, the moveable tube guiding member is moveable relative to the elongate
7 support member to change the distal tube path (and typically also the proximal tube
8 path where relevant).

9

10 Preferably, the moveable tube guiding member is moveable relative to the elongate
11 support member to thereby displace the distal tube path. Preferably, the moveable
12 tube guiding member is moveable relative to the elongate support member to thereby
13 change the orientation of the distal tube path relative to the insertion section. Thus,
14 the path along which a retained endotracheal tube having a particular configuration is
15 guided towards a patient's larynx in use, during intubation, can be changed by
16 movement of the moveable tube guiding member relative to the elongate support
17 member.

18

19 Preferably, the moveable tube guiding member is moveable relative to the elongate
20 support member to thereby displace and/or change the orientation of the distal tube
21 path relative to the insertion section, independently of advancement of the
22 endotracheal tube. Thus, the path at which an endotracheal tube extends towards a
23 patient's larynx in use can be adjusted before the endotracheal tube is advanced into
24 a patient's larynx. This provides a user with additional control of the intubation
25 procedure.

26

27 Preferably, the moveable tube guiding member is moveable relative to the elongate
28 support member to thereby displace and/or change the orientation of the distal tube
29 path without concomitantly detaching a retained endotracheal tube from the tube
30 guide.

31

32 Preferably, the moveable tube guiding member is moveable relative to the elongate
33 support member to adjust the distal tube path in a superior or inferior direction, either
34 or both displacing the distal tube path in a superior or inferior direction, or changing
35 the orientation of the distal tube path in a plane including the endotracheal tube and
36 the superior-inferior axis. We have found that adjustment of the distal tube path in a
37 superior or inferior direction is typically of most benefit during intubation.

1 Nevertheless, the moveable tube guiding member may be moveable relative to the
2 elongate support member to adjust the lateral position of the distal tube path.

3

4 Preferably, the insertion section extends distally of the moveable tube guiding
5 member. Thus, a given movement of the moveable tube guiding member will
6 typically have a greater effect on the position of the distal end of a retained
7 endotracheal tube extending beyond the distal end of the insertion section and
8 adjacent to a patient's larynx in use than would be the case if the moveable tube
9 guiding member was located at the distal end of the insertion section.

10

11 The moveable tube guiding member may be moveable prior to insertion of an
12 endotracheal tube. The moveable tube guiding member may be moveable by one or
13 more electric motors.

14

15 The insertion section may comprise a plurality of moveable tube guiding members.
16 Movement of some or all of the plurality of moveable tube guiding members may be
17 linked to facilitate adjustment of either or both of the position and orientation of a
18 retained endotracheal tube, as appropriate. For example, two or more moveable
19 tube guiding members may be mechanically connected and thereby be moveable
20 concurrently (for example, mechanically coupled to moved concurrently).

21

22 A first moveable tube guiding member may be provided on the proximal side of the
23 elongate support member in a distal region of the insertion section. A first moveable
24 tube guiding member may be provided on the superior side of the elongate support
25 member such that the first moveable tube guiding member is the most distal location
26 where a tube retained in the tube guide contacts any portion of the tube guide. The
27 first moveable tube guiding member may be moveable with a component parallel to
28 the superior-inferior axis to move the distal tip of a retained endotracheal tube parallel
29 to the superior-inferior axis in use.

30

31 A second tube guiding member may be provided proximally of the first moveable tube
32 guiding member and spaced apart from the first moveable tube guiding member so
33 that movement of the first moveable tube guiding member causes a retained
34 endotracheal tube to pivot around the second tube guiding member. Thus, the tip of
35 a retained endotracheal tube may move in geared relationship to movement of the
36 first moveable tube guiding member. Typically the insertion section is arranged so
37 that, in use, the tip of retained endotracheal tube adjacent to a patient's larynx in use

1 moves in geared relationship to the movement of the first moveable tube guiding
2 member with a gearing ratio of greater than 1.0.

3

4 The second tube guiding member may be a second moveable tube guiding member,
5 located proximally of the first moveable tube guiding member and moveable with a
6 component parallel to the superior-inferior axis to adjust the position and/or
7 orientation at which a retained endotracheal tube extends from the second moveable
8 tube guiding member to the first moveable tube guiding member and thus the distal
9 path section. Typically, the first and second moveable tube guiding members are
10 moveable together and the movement of each contributes to adjustment of the distal
11 path section such that the resulting adjustment of the distal path section is greater
12 than would be the case if only the first moveable tube guiding member or only the
13 second moveable tube guiding member moved.

14

15 The moveable tube guiding member may be mounted to the elongate support
16 member by way of a pivot. The tube guiding member may be mounted on a pivoting
17 member, wherein the pivot is located proximally of the moveable tube guiding
18 member. The moveable tube guiding member may comprise a movement limiting
19 formation (for example the periphery of an aperture in the moveable tube guiding
20 member) which engages with a cooperating formation of the elongate support
21 member to limit the range of movement of the moveable tube guiding member. The
22 moveable tube guiding member may be mounted to the elongate support member by
23 way of a universal joint, for example, a ball and socket joint.

24

25 Preferably, the moveable tube guiding member is moveable whilst the insertion
26 section is located within a patient ready for an endotracheal tube to be advanced into
27 the patient's larynx.

28

29 Preferably, the laryngoscope insertion section further comprises a manually operable
30 control to enable a user to move the moveable tube guiding member relative to the
31 elongate support member and thereby vary the either or both of the orientation and
32 position of a guided endotracheal tube relative to the elongate support member.

33

34 The manually operable control is preferably located to be operable with a user's
35 fingers whilst the insertion section is located within a patient's oral cavity and either or
36 both the position and orientation of the endotracheal tube are adjusted. Thus, the
37 manually operable control is typically located to extend (and potentially to be located

1 entirely) proximally of a patient's teeth when the insertion section is fully introduced
2 into a patient's oral cavity for intubation.

3

4 The manually operable control may communicate with the moveable tube guiding
5 member by way of a pulley. The manually operable control may communicate with
6 the moveable tube guiding member by way of a pneumatic or hydraulic conduit.

7 Thus, the moveable tube guiding member may be part of, or connected to a
8 pneumatic or hydraulic actuator operably connected to the manually operable by
9 control by a said pneumatic or hydraulic conduit. The moveable tube guiding
10 member may be moveable by an electronically controllable motor, which may be in
11 electronic communication with the manually operable control, by wired or wireless
12 means. The electronically controllable motor may be in electronic communication
13 with a remote tube moving control, by wired or wireless means.

14

15 The manually operable control may be integral to the moveable tube guiding
16 member. For example, the moveable tube guiding member may comprise a
17 manually operable lever extending proximally from the moveable tube guiding
18 member and functioning as the manually operable control. In this case, the
19 moveable tube guiding member is preferably mounted to the elongate support
20 member by a pivot. The manually operable control may be a portion of a moveable
21 control member which is coupled to the moveable tube guiding member. For
22 example, each of the lever and the moveable tube guiding member may be mounted
23 on respective pivoting members, which respective pivoting member are connected by
24 way of a pivot to rotate together as the lever is manually operated.

25

26 Where the insertion section comprises a plurality of moveable tube guiding members,
27 the manually operable control may be operable to cause a plurality or all of the
28 moveable tube guiding members to move concurrently. For example, where said first
29 and second moveable tube guiding members are provided operation of the manually
30 operable control may be operable to cause the second moveable tube guiding
31 member to move in a superior or inferior direction and the first moveable tube guiding
32 member to concurrently move in the opposite direction. It may be that the insertion
33 section comprises a pivoting member, pivotally attached to elongate support member
34 and wherein the pivoting member comprises formations functioning as the first and
35 second moveable tube guiding members so that the first and second moveable tube
36 guiding member move concurrently by rotation of the pivoting member around the
37 pivot. The pivoting member may comprise a manually operable lever.

1

2 The moveable tube guiding member may be pivotable to adjust the location and/or
3 orientation at which a retained endotracheal tube extends towards a patient's larynx
4 in use by manual manipulation of the retained endotracheal tube, either proximal of a
5 patient's teeth, or within a patient's oral cavity, adjacent the teeth. The moveable
6 tube guiding member is preferably located within the distal half of the region of the
7 insertion section which is located within the mouth of a patient of median size during
8 intubation.

9

10 The moveable tube guiding member may be moveable between a first position in
11 which an endotracheal tube of a first external diameter cannot be retained by and
12 guided by the tube guide and a second position in which an endotracheal tube of the
13 first external diameter can be retained by and guided by the tube guide. Thus, the
14 moveable tube guiding member may be used to reliably guide endotracheal tubes of
15 a wider range of external diameters than if the tube guide were fixed. Thus the
16 moveable tube guiding member may be moveable such that the distance between a
17 tube contacting portion of the moveable tube guiding member and the elongate
18 support member, adjacent the moveable tube guiding member, is varied.

19

20 The insertion section may be integral to a laryngoscope. The insertion section may
21 be demountably attachable to a laryngoscope. Preferably, the insertion section
22 comprises an elongate cavity extending along part of the length of the insertion
23 section to enable the insertion section to be demountably attached to an insertion
24 section retaining member of a laryngoscope.

25

26 Preferably, the tube guide is a tube guide for removably retaining an endotracheal
27 tube.

28

29 According to a second aspect of the present invention there is provided a
30 laryngoscope insertion section having a proximal end and a distal end for insertion
31 into a patient's oral cavity, the insertion section comprising a tube guide for retaining
32 an endotracheal tube and guiding a retained endotracheal tube towards a patient's
33 larynx, wherein the inferior surface of the insertion section comprises a distal patient
34 contacting point and the tube guide comprises a tube guiding mechanism to adjust
35 the position of the distal tip of a retained endotracheal tube relative to the distal
36 patient contacting point while the insertion section is positioned within a patient's oral
37 cavity for intubation.

1

2 The tube guiding member mechanism may comprise a moveable tube guiding
3 member. The moveable tube guiding member may be positioned transversely of the
4 insertion section. The distal tube contacting point is typically the distal tip of the
5 insertion section.

6

7 Thus, a user can introduce the insertion section and use the inferior surface of the
8 insertion section to lift the tissue adjacent the epiglottis and view the larynx. The user
9 can then adjust the position of the distal tip of a retained endotracheal tube, whilst the
10 insertion section is positioned within a patient's oral cavity for intubation.

11

12 Further optional features of the second aspect of the invention correspond to the
13 optional features described above in relation to the first aspect of the invention.

14

15 According to a third aspect of the invention there is provided a laryngoscope having
16 an insertion section retaining formation to demountably retain an insertion section
17 according to the first or second aspect of the invention. The invention also extends to
18 a laryngoscope comprising a handle and an insertion section according to the first or
19 second aspect of the invention fixedly attached thereto.

20

21 The laryngoscope preferably comprises a light source. The elongate cavity may be
22 operable to encompass the light source in use and the insertion section may
23 comprise a translucent or transparent portion to enable light from the light source to
24 be shone on a patient's larynx in use. Thus, the insertion section may function to
25 protect the light source from contact with bodily fluids and/or air during use.

26

27 The light source may be a light generating device, for example a light emitting diode
28 or a bulb. The light source may be a light emitting region of a light conduit operably
29 connected to or connectable to a light generating device.

30

31 The laryngoscope preferably comprises an image collector. The elongate cavity may
32 be adapted to encompass an image collector in use. The image collector may be a
33 camera. The image collector may comprise a light collecting region of a light conduit
34 and the light conduit may be operable to conduct light to a camera.

35

36 The insertion section retaining formation may comprise an elongate image collector
37 support including the image collector and arranged to extend into the elongate cavity

1 in use so as to collect images of a region including a patient's larynx during
2 intubation.

3

4 The elongate image collector support may comprise a rigid strengthening element.
5 For example, it may comprise an elongate rigid metal housing. The light source may
6 also be mounted in or on the elongate image collector. However, the elongate image
7 collector support may be flexible.

8

9 In embodiments where the moveable tube guiding member is moveable responsive
10 to operation of a manually operable control, the manually operable control may be
11 located proximally of a patient's teeth in use, for example adjacent or on the handle of
12 the laryngoscope. The laryngoscope may comprise a pivoting member having the
13 moveable tube guiding member thereon, wherein the moveable tube guiding member
14 is mounted on the moveable tube guiding member and the pivoting member is
15 pivotably attached to the laryngoscope handle.

16

17 In embodiments including an image collector for imaging the larynx during intubation,
18 and at least one manual control for controlling movement of the moveable tube
19 guiding member, the image collector, the insertion section, at least one manual
20 control and the moveable tube guiding member may be formed and arranged so that
21 movement of a said at least one manual control moves the tip of a retained
22 endotracheal tube vertically up or down in the images collected by the image
23 collector. The image collector, the insertion section, a second manual control and the
24 moveable tube guiding member may be formed and arranged so that movement of
25 the second manual control moves the tip of a retained endotracheal tube left or right
26 in the images collected by the image collector. This facilitates easy adjustment of the
27 location of a retained endotracheal tube relative to a patient's larynx during
28 intubation.

29

30 Where the insertion section is an insertion section according to the second aspect of
31 the invention, the laryngoscope may further comprise a flexible tube guiding member
32 extending from the handle of the laryngoscope adjacent the insertion section, which
33 flexible tube guiding member is flexible responsive to operation of a manual control,
34 to adjust the position the distal tip of a retained endotracheal tube relative to the distal
35 patient contacting point while the insertion section is positioned within a patient's oral
36 cavity for intubation.

37

1 The flexible tube guiding member may comprise a bougie for introduction into the
2 bore of an endotracheal tube. The flexible tube guiding member may be adapted to
3 contact an exterior surface of an endotracheal tube, for example, the flexible tube
4 guiding member may comprise a channel within which an endotracheal tube can be
5 retained.

6

7 The flexible tube guiding member may comprise an actuator operable to flex the
8 flexible tube guiding member responsive to operation of a manual control. The
9 actuator may be an electric motor. The actuator may be a hydraulic or pneumatic
10 actuator. The actuator may comprise a shape memory alloy (e.g. "muscle wire").

11

12 Description of the Drawings

13

14 An example embodiment of the present invention will now be illustrated with
15 reference to the following Figures in which:

16

17 Figure 1 is a side view of a laryngoscope insertion section retaining an endotracheal
18 tube having an external diameter at the upper end of an operating range of external
19 diameters, with the movable tube guide member in a tube raising configuration;

20

21 Figure 2 is a side view of the laryngoscope insertion section, without a retained
22 endotracheal tube, with the movable tube guiding member in a tube raising
23 configuration;

24

25 Figure 3 is a side view of the laryngoscope insertion section retaining an
26 endotracheal tube having an external diameter at the upper end of the operating
27 range of external diameters, with the movable tube guiding member in a tube
28 lowering configuration;

29

30 Figure 4 is a side view of the laryngoscope insertion section, without a retained
31 endotracheal tube, with the movable tube guiding member in a tube lowering
32 configuration;

33

34 Figure 5 is a side view of the laryngoscope insertion section retaining an
35 endotracheal tube having an external diameter at the lower end of the operating
36 range of external diameters, with the movable tube guiding member in a tube raising
37 configuration;

1

2 Figure 6 is a cross-section through a patient, illustrating the position of the
3 laryngoscope insertion section and an endotracheal tube having an external diameter
4 at the lower end of the operating range of external diameters, when the movable tube
5 guiding member is in the tube raising configuration, or in the tube lowering
6 configuration;

7

8 Figure 7 is a side view of the laryngoscope insertion section retaining an
9 endotracheal tube having an external diameter at the low end of the operating range
10 of external diameters, illustrating the position of the endotracheal tube with the
11 movable tube guiding member in a tube raising configuration, or a tube lowering
12 configuration;

13

14 Figure 8 corresponds to Figure 7, except that the illustrated endotracheal tube is an
15 endotracheal tube having an external diameter at the lower end of the operating
16 range of external diameters;

17

18 Figure 9 is an isometric view of the distal tip of an insertion section according to
19 Figure 1 and a retained endotracheal tube;

20

21 Figure 10 is an isometric view of the proximal end of an insertion section according to
22 Figure 1 and a retained endotracheal tube;

23

24 Figure 11 is an isometric view of a laryngoscope without an attached insertion
25 section;

26

27 Figure 12 is an isometric view of the laryngoscope of Figure 11 with an insertion
28 section of Figure 1 attached thereto;

29

30 Figure 13 is a side view of an alternative embodiment of an insertion section, having
31 to pivoting tube guide portions;

32

33 Figure 14 is an isometric view of the insertion section of Figure 13;

34

35 Figure 15 is a plan view of the insertion section of Figure 13;

36

37 Figure 16 is a side view of a further alternative embodiment of an insertion section;

1

2 Figure 17 is an isometric view of the insertion section of Figure 16;

3

4 Figure 18 is a plan view of the insertion section of Figure 1, retaining an endotracheal
5 tube at an upper end of the operating range of endotracheal tube external diameters;
6 and

7

8 Figure 19 is a detail of the distal tip of the insertion section and retained tube of
9 Figure 18.

10

11 Figures 20a and 20b illustrate a laryngoscope having an insertion section and a
12 bougie extending from the laryngoscope handle adjacent the insertion section and
13 operable responsive to a manual control;

14

15 Figures 21a and 21b illustrate a laryngoscope in which the moveable tube guide is
16 operable by a manual control located on the laryngoscope handle.

17

18 Detailed Description of an Example Embodiment

19

20 With reference to Figures 1 through 8, a laryngoscope insertion section, shown
21 generally as 1, has a body 2, formed as a unitary moulding from a transparent
22 plastics material and functioning as the elongate support member. The body has a
23 smooth inferior surface 4, which contacts a patient's palette in use, an opposing
24 superior surface 6, a first smooth lateral surface 8, and an opposing second lateral
25 surface 10. The second lateral surface has a profile including a concave groove
26 which runs along the majority of the length of the second lateral surface and which
27 functions as part of a tube guide for an endotracheal tube 12A, 12B. The insertion
28 section has a distal end 14 comprising a spatula member 16 which functions, in use,
29 to lift a patient's anatomy adjacent the epiglottis.

30

31 The insertion section further defines an elongate cavity 16 which extends along a part
32 of the length of the insertion section from an aperture 18. The elongate cavity is
33 closed off at its distal end by a window 20. The elongate cavity curves gently and is
34 sized to retain a support member 104 of a laryngoscope 100, illustrated in Figure 10.
35 The distal end of the elongate cavity is sealed to protect a camera 106 provided at
36 the distal end of the laryngoscope support member from bodily fluids in use, while
37 providing a viewing port through which the camera can image a patient's larynx

1 during intubation. The insertion section is formed and arranged to fit over the support
2 member like a sleeve. The insertion section is elongate and curved, and generally
3 within a plane.

4

5 A pivoting member 50 is attached to the second lateral surface of the insertion
6 section by way of a pivot 52. The pivoting member includes a distal superior tube
7 guiding member 54 (functioning as the moveable tube guiding member), located
8 distally of the pivot, having a concave elongate groove on an inferior surface thereof,
9 the distal tip of which contacts the superior surface of a retained endotracheal tube in
10 use. The pivoting member includes an inferior tube guiding member 56 (functioning
11 as a further moveable tube guiding member), located proximally of the pivot, having a
12 concave elongate groove on a superior surface thereof, at least the proximal tip of
13 which contacts the inferior surface of a retained endotracheal tube in use. The
14 pivoting member is rotatable around the pivot, in the plane of the insertion section,
15 and its movement is limited by the periphery of an aperture 58 through the pivoting
16 member, which engages with a pin 60 extending from the second lateral surface of
17 the insertion section. As the pivoting member can be rotated in use, the position of
18 the distal superior tube guiding member, which is positioned transversely of (in this
19 example mounted transversely to) the body of the insertion section, can be moved
20 relative to the body of the insertion section adjacent the distal superior tube guiding
21 member.

22

23 A tube guide is formed by the distal superior tube guiding member and the inferior
24 tube guiding members, as well as a proximal superior tube guiding member 62,
25 which, in this embodiment, is fixedly mounted to the insertion section, located
26 towards the proximal end of the insertion section, having a concave elongate groove
27 on an inferior surface thereof, at least the distal tip of which contacts the superior
28 surface of a retained endotracheal tube in use. The concave elongate groove of the
29 proximal superior tube guiding member extends slightly in the superior direction
30 towards its distal tip, to retain an endotracheal tube at a smaller radius of curvature
31 than the radius of curvature of the insertion section at the distal to the third tube
32 guiding member, as can be seen from Figure 1 and Figure 3. The proximal tip of the
33 inferior tube guiding member is longitudinally spaced from the distal tip of the
34 proximal superior tube guiding member so that the endotracheal tube can follow a
35 path with a smaller radius of curvature than the insertion section. This arrangement
36 enables the tube guide to be especially thin in the region of a patient's teeth and, as
37 the inferior surface of a retained endotracheal tube is left exposed, the endotracheal

1 tube may be grasped by the user. As will be evident from Figure 1 and Figure 3, the
2 insertion section is also useful with endotracheal tubes of a wide range of external
3 diameters, which follow slightly different paths along the length of the insertion
4 section.

5

6 The insertion section is for use as a disposable accessory for a laryngoscope 100,
7 illustrated in Figures 11 and 12. The laryngoscope includes a handle 102 from which
8 support member 104 extends. The support member has, at a distal tip, camera 106
9 (functioning as a light collector) and an LED light source 108. The support member is
10 formed from steel and provides mechanical support for an insertion section retained
11 on the support member in use. A battery within the handle (not shown) provides
12 power to the camera and light source. A video screen 110 receives and displays
13 images from the camera in use. The support member may be integral to the body of
14 the laryngoscope or demountable, for example, to enable the support member to be
15 separately sterilised. The junction between the laryngoscope body and support
16 member may be adjustable to vary the maximum distance to which the support
17 member extends from the laryngoscope body. The support member curves gently
18 within a plane. The plane of the support member is optionally laterally offset from the
19 central axis of the laryngoscope.

20

21 In use, a new disposable insertion section, which has typically been kept in a sterile
22 package since manufacture, is slid onto the retaining member until the tip of the
23 retaining member is adjacent the transparent window. The insertion section protects
24 the retaining member and the camera and light source at the distal end of the
25 retaining member. Furthermore, light from the light source is directed towards and
26 beyond the distal tip of the insertion section and the camera is operable to collect
27 images of the distal tip of the insertion section and the surrounding space. As the
28 retaining member is formed from steel, it functions as a strengthening element,
29 reinforcing the insertion section.

30

31 Next, an endotracheal tube is inserted into the tube guide. The endotracheal tube is
32 held in flexural tension by the proximal and distal superior tube guiding member and
33 the inferior tube guiding member. The proximal and distal superior tube guiding
34 members exert forces in an inferior direction on the endotracheal tube and the inferior
35 tube guiding member exerts forces in a superior direction, such that the endotracheal
36 tube is both held in place and guided along a path. The flexural tension serves to
37 retain the tube in position and avoids the requirement for further tube retaining

1 members. Furthermore, the position of the proximal and distal superior tube guiding
2 member and the inferior tube guiding member defines the path by which a retained
3 endotracheal tube having a given external diameter extends along the insertion
4 section (functioning as the proximal tube path) when no external force is applied to
5 the endotracheal tube. The position of the proximal and distal superior tube guiding
6 members and the inferior tube guiding member further defines the path (the distal
7 tube path) by which a retained endotracheal tube having a given external diameter
8 would extend beyond the insertion section, towards a patient's larynx in use, when no
9 external force is applied to the endotracheal tube.

10

11 Initially, a retained endotracheal tube extends distally of the distal superior tube
12 guiding member but is preferably not sufficiently far advanced as to extend beyond
13 the distal tip of the insertion section. The endotracheal tube is retained in flexural
14 tension from the most proximal location where it contacts the tube guide to the most
15 distal location where it contacts the tube guide. As a result of this flexural tension,
16 and the gentle curvature which is typical of endotracheal tubes, the tube exerts a
17 force in the superior direction on the distal superior tube guiding member, as well as
18 a force in the inferior direction on the inferior tube guiding member. Thus, the
19 pivoting member will typically rest in a position determined by the movement limiter,
20 referred to as the tube lowering position and illustrated, for example, in Figure 3.

21

22 The laryngoscope is then manipulated to introduce the insertion section into a
23 patient's oral cavity, using the spatulate tip portion to lift the patient's anatomy around
24 the epiglottis, exposing the larynx. During this stage, images from the camera are
25 transmitted by a wired or wireless connection to a display screen which can
26 conveniently be attached to the handle of the laryngoscope but may alternatively be
27 separate to the laryngoscope. As the endotracheal tube is already retained within the
28 tube guide, the user will not be required to carry out the additional step of introducing
29 an endotracheal tube into a patient's oral cavity, freeing up one of their hands.
30 However, the laryngoscope, insertion section and tube guide may also be configured
31 so that an endotracheal tube can be introduced into the tube guide and advanced
32 along the tube guide after insertion of the laryngoscope into a patient's oral cavity.

33

34 The user will adjust the position of the laryngoscope so as to provide a good view of
35 the patient's larynx. Typically, the endotracheal tube will not initially be aligned
36 perfectly to advance into the larynx. The insertion section is designed so that when
37 the distal tip of the insertion section is in the correct position to best lift the patient's

1 anatomy around the epiglottis and expose the larynx, an endotracheal tube located in
2 the tube guide will typically be located at, or close to, the correct lateral position to
3 advance a tube into a patient's larynx. However, there may well be a significant
4 difference between the position of the distal tip of the endotracheal tube parallel to
5 the inferior-superior axis, or the angle at which the distal tip of the endotracheal tube
6 extends in the plane of the insertion section. (The plane of the insertion section is
7 typically a vertical plane in use as patients are virtually always intubated lying on their
8 backs with their midsagittal plane vertical, and their neck tilted backwards).

9

10 The user then adjusts the orientation of the distal tip of the endotracheal tube in the
11 plane of the insertion section by contacting the endotracheal tube with their fingers
12 adjacent to and possibly distally of the proximal superior tube guiding member which,
13 when the larynx is fully in view, is typically adjacent to or just outside of a patient's
14 teeth. As users of laryngoscopes typically grip laryngoscopes at the base of the
15 handle and proximal end of the insertion section, this is a natural movement. By
16 slight movements of their fingers, users can change the orientation at which the
17 endotracheal tube contacts the distal end of the proximal superior tube guiding
18 member. By increasing the angle of incidence of the endotracheal tube on the distal
19 end of the proximal superior tube guiding member, the pivoting member pivots such
20 that the inferior tube guiding member moves in an superior direction and the distal
21 superior tube guiding member moves in an inferior direction. As a result, the tip of
22 the retained endotracheal tube moves in an inferior direction. As the inferior tube
23 guiding member and distal superior tube guiding member are linked and move
24 together, and as the insertion section extends distally of the distal superior tube
25 guiding member, a relatively small adjustment of the angle of incidence of the
26 endotracheal tube on the distal end of the proximal superior tube guiding member
27 can have a substantial effect on the movement of the distal tip of the endotracheal
28 tube. Movement of the distal tip of the endotracheal tube in an inferior direction is
29 effectively geared to movement of the distal superior tube guiding member in an
30 inferior direction, with a gearing ratio of greater than 1.0 so that a compact insertion
31 section can readily control significant movements in the distal tip of the retained
32 endotracheal tube. The camera and display screen are typically configured so that
33 the inferior direction is uppermost and so manually increasing the angle of incidence
34 of the endotracheal tube will appear to move the tip of the endotracheal tube upwards
35 on the display. The maximum extent to which the distal tip of the retained
36 endotracheal tube can be moved in the inferior direction, referred to here as the tube
37 raising position, is illustrated, for example, in Figure 1.

1

2 Once the user is happy with the location of the distal tip of the endotracheal tube
3 relative to the larynx, the user can advance the tube with their fingers, thereby
4 intubating the patient. Advantageously the user has been able to locate the spatulate
5 tip of the laryngoscope insertion section while concentrating on lifting the tissue
6 adjacent the epiglottis to best expose the larynx, without having to adjust the location
7 of the insertion section to orient the retained endotracheal tube relative to the
8 patient's larynx. They can subsequently focus their attention on positioning the distal
9 tip of the endotracheal tube, using their fingers, to direct the endotracheal tube
10 towards a patient's larynx. As movement of the tip of the endotracheal tube in the
11 inferior or superior direction can be accomplished without significantly advancing the
12 endotracheal tube, the endotracheal tube can be advanced as a separate action.
13 Finally, the endotracheal tube is detached from the tube guide and the laryngoscope
14 and attached insertion section are removed from the oral cavity, leaving the
15 endotracheal tube. The insertion section can then be disposed of and the
16 laryngoscope reused for further intubations.

17

18 Typically, the insertion section is designed to be used with endotracheal tubes of a
19 range of sizes. The range of external diameters of endotracheal tubes with which an
20 insertion section can be reliably used is referred to as the an operating range of
21 endotracheal tube sizes. The operating range of endotracheal tube size, and the
22 dimensions of the insertion section will depend on the application of the insertion
23 section. An insertion section for use with adult humans may, for example, be adapted
24 to be usable reliably with endotracheal tubes with an external diameter of up to
25 12.3mm. Tubes of this external diameter are referred to as Size 9.0 in the field. The
26 minimum external diameter may be around 5.5mm. Where the insertion section is
27 made from a plastics material, the mean thickness of the inferior and first superior
28 tube guiding members typically requires to be at least 0.75mm (preferably around
29 1.5mm) to provide suitable mechanical strength for internal use. Accordingly, the
30 thickness of the first region is preferably less than 15.3mm, more preferably less than
31 14.6mm, 13.8mm or more preferably less than 13.1mm, in the case of an insertion
32 section for inserting endotracheal tubes into adult humans.

33

34 The dimensions of an insertion section for use with infant humans, including new
35 born infants, are typically scaled proportionately from the dimensions of an insertion
36 section for use with human adults. Nevertheless, the proportions of some features,
37 such as the thickness of the tube guiding members, may not scale proportionately. In

1 the case of an insertion section for inserting endotracheal tubes into infant humans,
2 including new born infants, the operating range of external tube diameters may be 1.0
3 to 5.0mm, and the thickness of the first region is preferably less than 8.0mm,
4 preferably less than 7.0mm, or more preferably less than 6.0mm.

5
6 Figure 13 through 15 illustrate an alternative embodiment of an insertion section,
7 which includes a pivoting member 50 and a control member 70 which is also
8 rotatable, around a pivot 72. The control member includes a lever 74, proximal
9 superior tube guiding member and proximal inferior tube guiding member 76, having
10 an elongate aperture 75 in the inferior face thereof to enable a user to contact and
11 advance a retained endotracheal tube. The tube guiding member is attached to the
12 pivoting member by way of a further pivoting joint 78. As a result of this arrangement,
13 the control member and pivoting member rotate together. Thus, a user can adjust the
14 position of the distal superior tube guiding member and therefore the position of the
15 distal tip of a retained endotracheal tube, by manual adjustment of the angle between
16 the lever and the insertion section. This angle may be adjusted using by directly
17 rotating the lever, or by holding and adjusting the trajectory of the endotracheal tube.

18
19 Figures 16 and 17 illustrate a further embodiment of an insertion section in which the
20 pivoting member has an integral lever 80 so that the position of the distal superior
21 tube guiding member in the superior-inferior direction and therefore the location of the
22 distal tip of a retained endotracheal tube can be adjusted by varying the angle of the
23 integral lever relative to the adjacent insertion section.

24
25 One or more moveable tube guiding members can be moved relative to the adjacent
26 insertion section body by other means. For example, an electronic motor may be
27 employed to move the distal superior tube guiding member, and optionally one or
28 more other tube guiding members, in an inferior or superior direction, to thereby
29 adjust the path at which a retained endotracheal tube extends toward a patient's
30 larynx in use. The electric motor can be controlled by manually operable controls
31 (such as a dial or buttons) on the laryngoscope handle, insertion section, or remotely,
32 and control signals can be transmitted to the electric motor by wired or wireless
33 connection. Two or more tube guiding members may move concurrently, in the same
34 or opposite senses, under the control of a single motor.

35
36 A tube guiding member can also be moved relative to adjacent insertion section by a
37 pneumatic or hydraulic actuator connected to a manually operable control (such as a

1 button) located on the laryngoscope handle or insertion section by a pneumatic or
2 hydraulic conduit. The pneumatic or hydraulic actuator may be a balloon. The tube
3 guiding member may be, or be formed on, a surface of a pneumatic or hydraulic
4 actuator which inflates or deflates responsive to operation of a manually operable
5 control.

6

7 Figures 20a and 20b illustrate a video laryngoscope 100 having an insertion section 1
8 and a bougie 102 extending from the laryngoscope handle adjacent the insertion
9 section and operable responsive to a manual control 104. Movement of the manual
10 control up and down leads to a corresponding or opposite movement of the distal tip
11 of the bougie. Figures 21a and 21b illustrate a video laryngoscope 100 having a
12 moveable tube guide 106 operable by a manual control 104 located on the
13 laryngoscope handle. Movement of the manual control up and down leads to a
14 corresponding or opposite movement of a distal tube contacting portion 108 of the
15 tube guide and a corresponding movement of the distal tip of an endotracheal tube
16 retained in the tube guide.

17

18 Further variation and modifications may be considered by one skilled in the art, within
19 the scope of the invention herein disclosed.

1 Claims

2

3 1. A laryngoscope insertion section having a proximal end and a distal end for
4 insertion into a patient's oral cavity, the insertion section comprising a tube
5 guide for retaining an endotracheal tube and guiding a retained endotracheal
6 tube towards a patient's larynx, wherein the insertion section comprises an
7 elongate support member and the tube guide comprises a moveable tube
8 guiding member which is positioned transversely of the elongate support
9 member and moveable relative to the elongate support member adjacent the
10 moveable tube guiding member.

11

12 2. A laryngoscope insertion section according to claim 1, wherein the moveable
13 tube guiding member is positioned laterally of the insertion section.

14

15 3. A laryngoscope insertion section according to claim 1 or claim 2, wherein the
16 tube guide, including the tube guiding member, defines at least in part a distal
17 tube path along which a detachably retained endotracheal tube which has
18 been advanced sufficiently far in a distal direction extends from the distal end
19 of the insertion section towards a patient's larynx during intubation, wherein
20 the moveable tube guiding member is moveable relative to the elongate
21 support member to change the distal tube path.

22

23 4. A laryngoscope insertion section according to claim 3, wherein the moveable
24 tube guiding member is moveable relative to the elongate support member to
25 thereby displace the distal tube path.

26

27 5. A laryngoscope insertion section according to claim 3 or claim 4, wherein the
28 moveable tube guiding member is moveable relative to the elongate support
29 member to thereby change the orientation of the distal tube path relative to
30 the insertion section.

31

32 6. A laryngoscope insertion section according to any one of claims 3 to 5,
33 wherein the moveable tube guiding member is moveable relative to the
34 elongate support member to thereby displace and/or change the orientation of
35 the distal tube path relative to the insertion section, independently of
36 advancement of the endotracheal tube.

37

- 1 7. A laryngoscope insertion section according to any one of claims 3 to 6,
2 wherein the moveable tube guiding member is moveable relative to the
3 elongate support member to thereby displace and/or change the orientation of
4 the distal tube path without concomitantly detaching a retained endotracheal
5 tube from the tube guide.
6
- 7 8. A laryngoscope insertion section according to any one of claims 3 to 7,
8 wherein the moveable tube guiding member is moveable relative to the
9 elongate support member to adjust the distal tube path in a superior or inferior
10 direction, either or both displacing the distal tube path in a superior or inferior
11 direction, or changing the orientation of the distal tube path in a plane
12 including the endotracheal tube and the superior-inferior axis.
13
- 14 9. A laryngoscope insertion section according to any one preceding claim,
15 wherein the insertion section extends distally of the moveable tube guiding
16 member.
17
- 18 10. A laryngoscope insertion section according to any one preceding claim,
19 wherein the insertion section comprises a plurality of moveable tube guiding
20 members, wherein movement of some or all of the plurality of moveable tube
21 guiding member is linked to facilitate adjustment of either or both of the
22 position and orientation of a retained endotracheal tube.
23
- 24 11. A laryngoscope insertion section according to claim 10, wherein two or more
25 moveable tube guiding members are mechanically connected and thereby
26 moveable concurrently.
27
- 28 12. A laryngoscope insertion section according to claim 10 or claim 11, wherein
29 the first moveable tube guiding member is provided on the proximal side of
30 the elongate support member in a distal region of the insertion section, such
31 that the first moveable tube guiding member is the most distal location where
32 a tube retained in the tube guide contacts any portion of the tube guide, the
33 first moveable tube guiding member is moveable with a component parallel to
34 the superior-inferior axis to move the distal tip of a retained endotracheal tube
35 parallel to the superior-inferior axis in use, and a second tube guiding member
36 is provided proximally of the first moveable tube guiding member and spaced
37 apart from the first moveable tube guiding member so that movement of the

1 first moveable tube guiding member causes a retained endotracheal tube to
2 pivot around the second tube guiding member.

3

4 13. A laryngoscope insertion section according to any one preceding claim,
5 wherein the moveable tube guiding member is mounted to the elongate
6 support member by way of a pivot.

7

8 14. A laryngoscope insertion section according to any one preceding claim,
9 wherein the laryngoscope insertion section further comprises a manually
10 operable control to enable a user to move the moveable tube guiding member
11 relative to the elongate support member and thereby vary the either or both of
12 the orientation and position of a guided endotracheal tube relative to the
13 elongate support member.

14

15 15. A laryngoscope insertion section according to claim 14, wherein the manually
16 operable control is integral to the moveable tube guiding member.

17

18 16. A laryngoscope insertion section according to claim 14 or claim 15, wherein
19 the manually operable control is a portion of a moveable control member
20 which is coupled to the moveable tube guiding member.

21

22 17. A laryngoscope insertion section according to any one of claims 14 to 16,
23 wherein the insertion section comprises a plurality of moveable tube guiding
24 members, and wherein the manually operable control is operable to cause a
25 plurality or all of the moveable tube guiding members to move concurrently.

26

27 18. A laryngoscope insertion section according to any one preceding claim,
28 wherein the moveable tube guiding member is pivotable to adjust the location
29 and/or orientation at which a retained endotracheal tube extends towards a
30 patient's larynx in use by manual manipulation of the retained endotracheal
31 tube, either proximal of a patient's teeth, or within a patient's oral cavity,
32 adjacent the teeth.

33

34 19. A laryngoscope insertion section according to any one preceding claim,
35 wherein the moveable tube guiding member is moveable between a first
36 position in which an endotracheal tube of a first external diameter cannot be
37 retained by and guided by the tube guide and a second position in which an

1 endotracheal tube of the first external diameter can be retained by and guided
2 by the tube guide.

3

4 20. A laryngoscope having an insertion section retaining formation to
5 demountably retain an insertion section according to any one preceding claim.

6

7 21. A laryngoscope comprising a handle and an insertion section according to any
8 one of claims 1 to 19 fixedly attached thereto.

9

10 22. A laryngoscope insertion section having a proximal end and a distal end for
11 insertion into a patient's oral cavity, the insertion section comprising a tube
12 guide for retaining an endotracheal tube and guiding a retained endotracheal
13 tube towards a patient's larynx, wherein the inferior surface of the insertion
14 section comprises a distal patient contacting point and the tube guide
15 comprises a tube guiding mechanism to adjust the position of the distal tip of
16 a retained endotracheal tube relative to the distal patient contacting point
17 while the insertion section is positioned within a patient's oral cavity for
18 intubation.

19

20 23. A laryngoscope insertion section according to claim 22, wherein the distal
21 tube contacting point is the distal tip of the insertion section.

22

23 24. A laryngoscope having an insertion section retaining formation to
24 demountably retain an insertion section according to claim 22 or claim 23.

25

26 25. A laryngoscope comprising a handle and an insertion section according to
27 claim 22 or claim 23 fixedly attached thereto.

28

29 26. A laryngoscope according to claim 24 or claim 25, wherein the laryngoscope
30 further comprises a flexible tube guiding member extending from the handle of
31 the laryngoscope adjacent the insertion section, which flexible tube guiding
32 member is flexible responsive to operation of a manual control, to adjust the
33 position the distal tip of a retained endotracheal tube relative to the distal
34 patient contacting point while the insertion section is positioned within a
35 patient's oral cavity for intubation.

36

- 1 27. A laryngoscope according to claim 26, wherein the flexible tube guiding
2 member comprises a bougie for introduction into the bore of an endotracheal
3 tube.
4
- 5 28. A laryngoscope according to claim 26, wherein the flexible tube guiding
6 member comprises a channel within which an endotracheal tube can be
7 retained.
8
- 9 29. A laryngoscope according to any one of claims 26 to 28, wherein the flexible
10 tube guiding member comprises an actuator operable to flex the flexible tube
11 guiding member responsive to operation of a manual control.
12
- 13 30. A laryngoscope according to claim 29, wherein the actuator is selected from a
14 group comprising: an electric motor, a hydraulic actuator, a pneumatic
15 actuator, an actuator comprising a shape memory alloy.
16

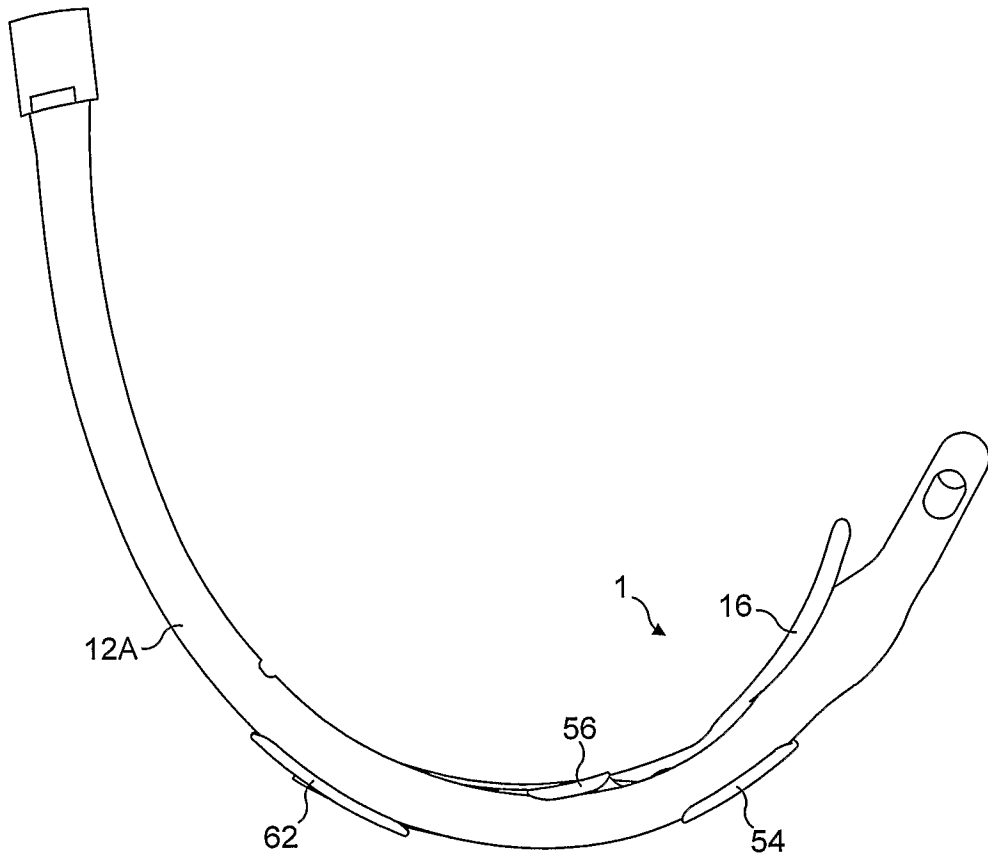


FIG. 1

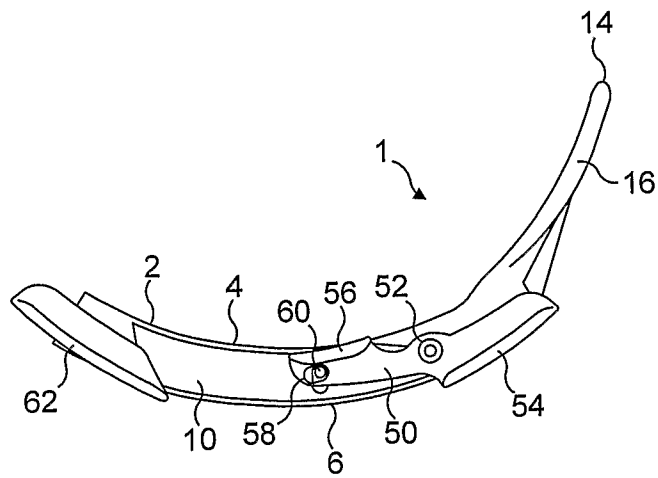


FIG. 2

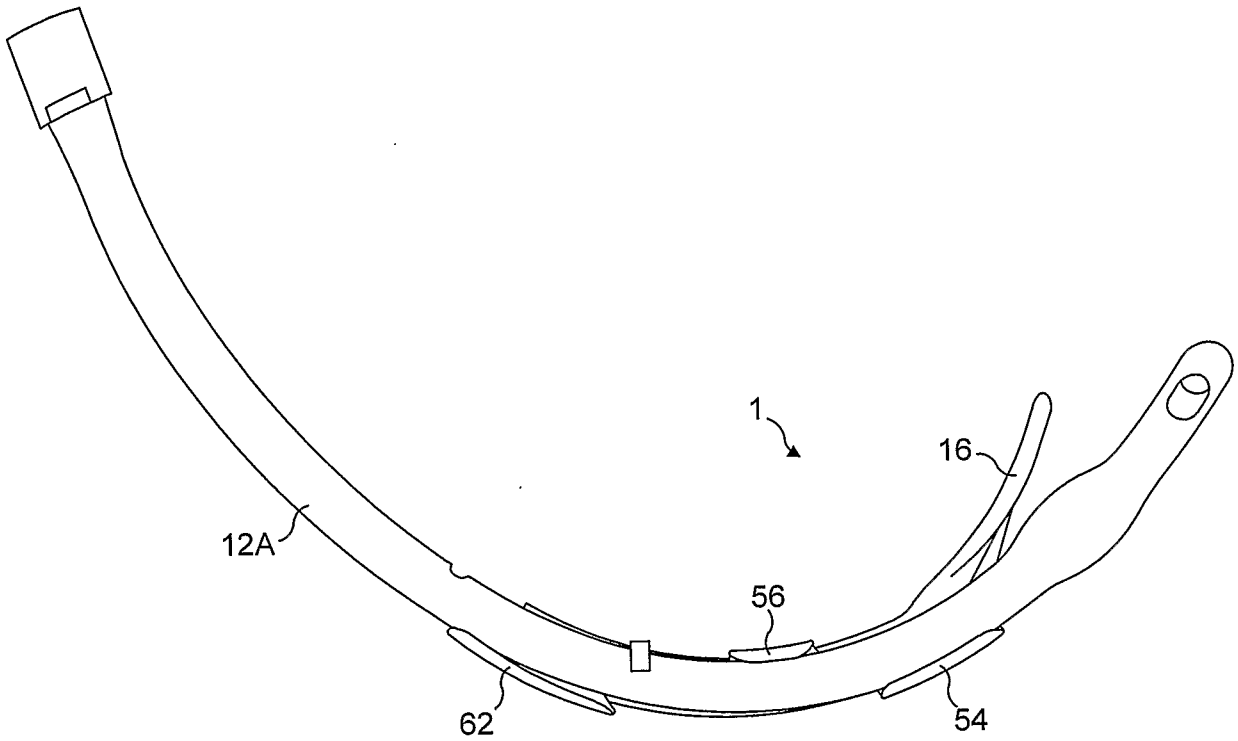


FIG. 3

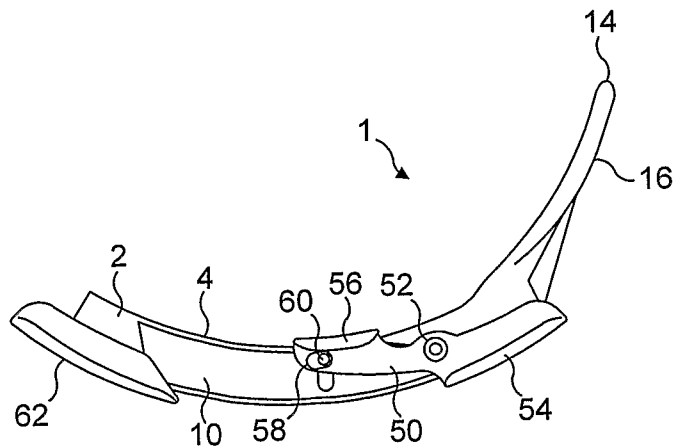


FIG. 4

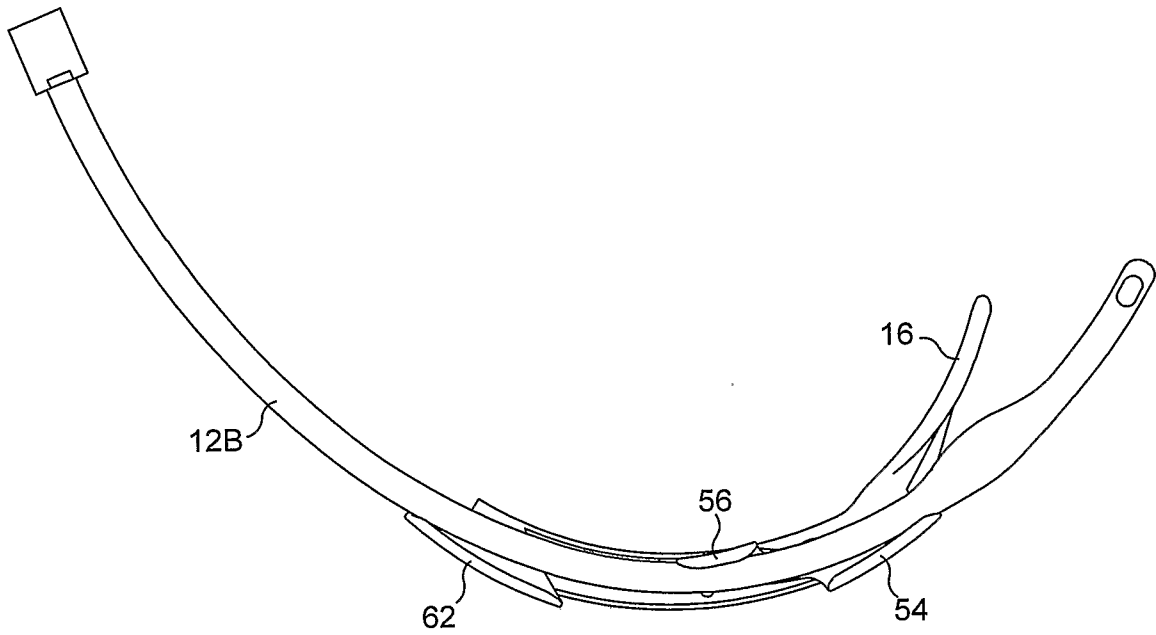


FIG. 5

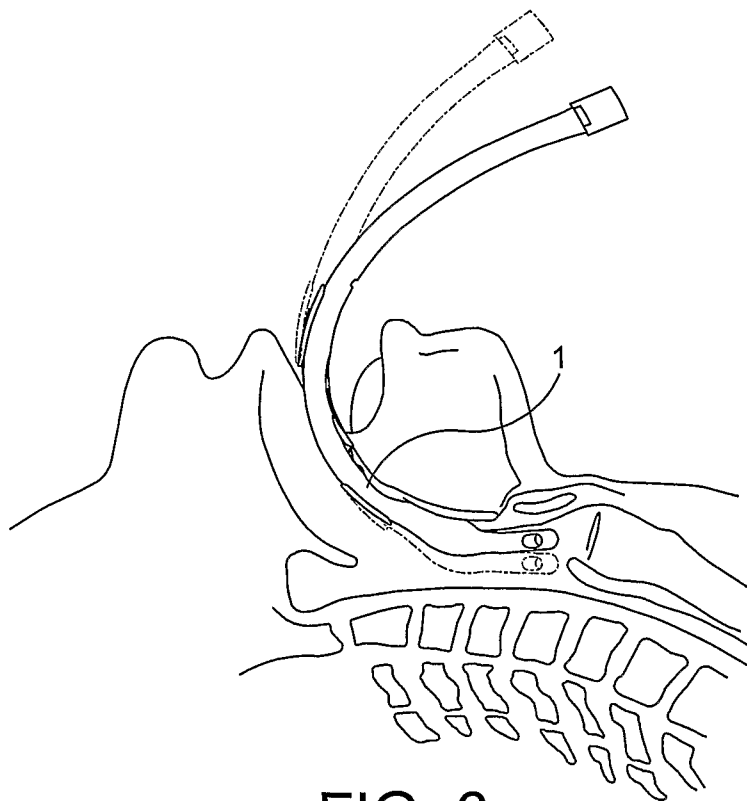


FIG. 6

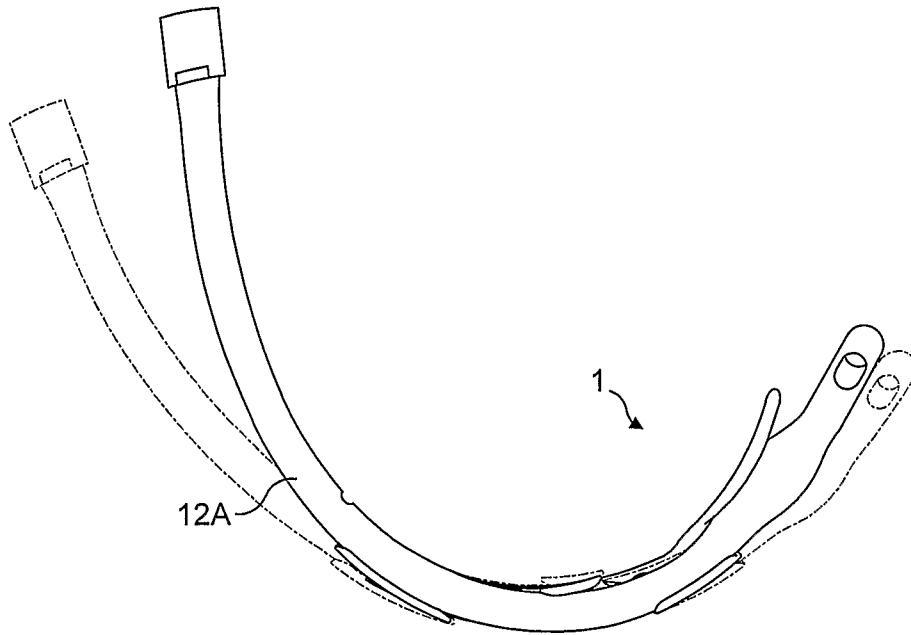


FIG. 7

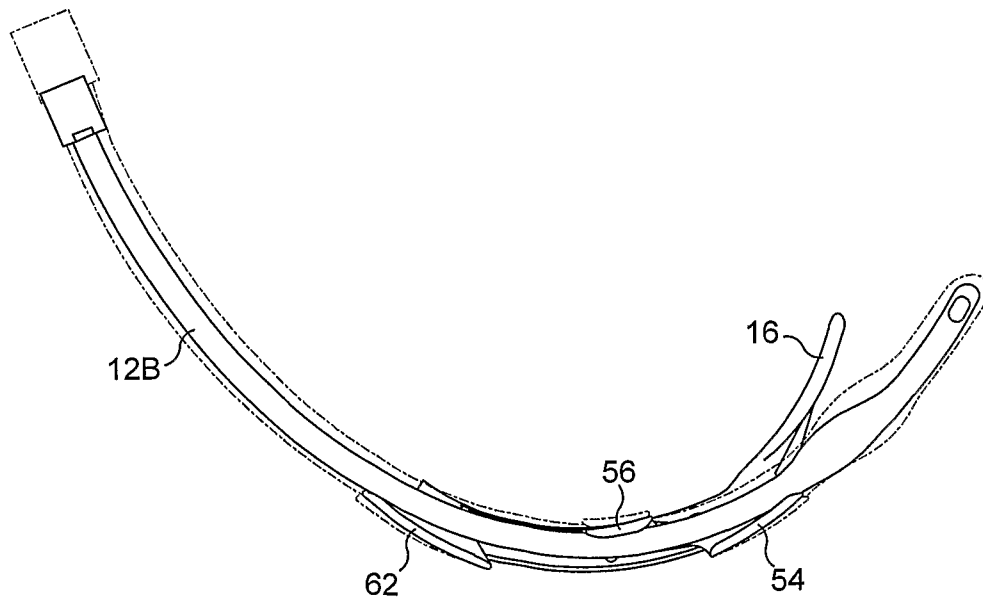


FIG. 8

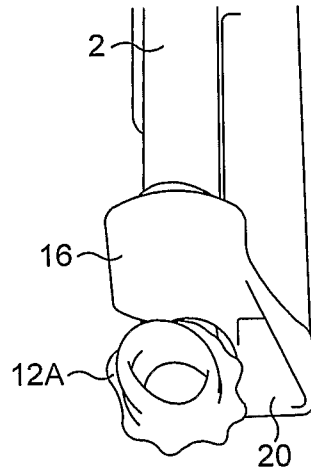


FIG. 9

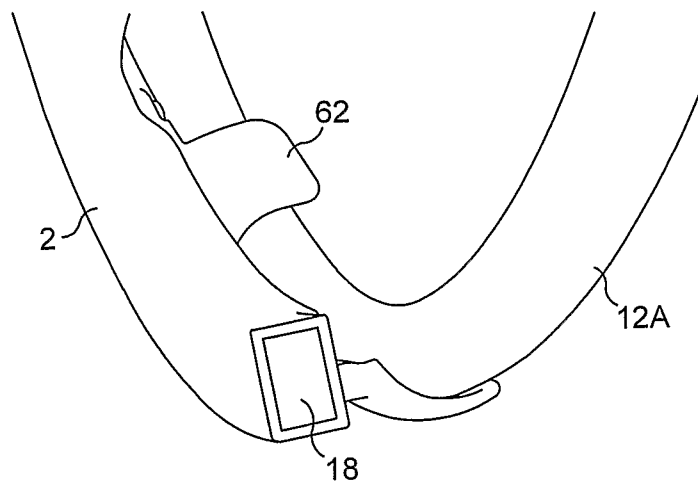


FIG. 10

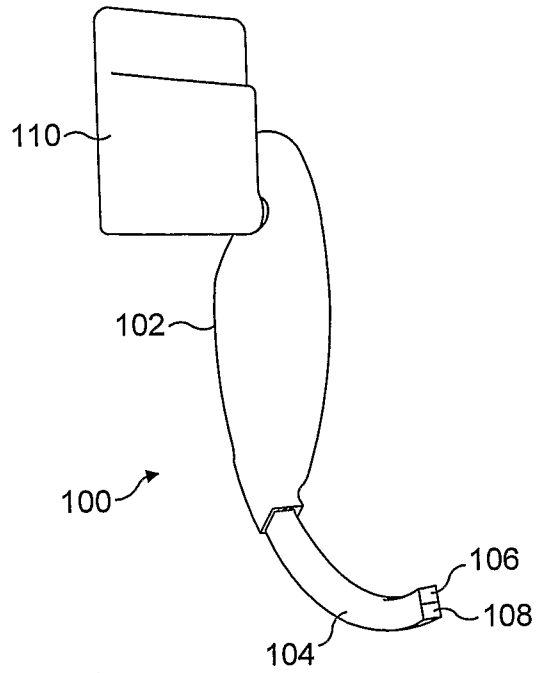


FIG. 11

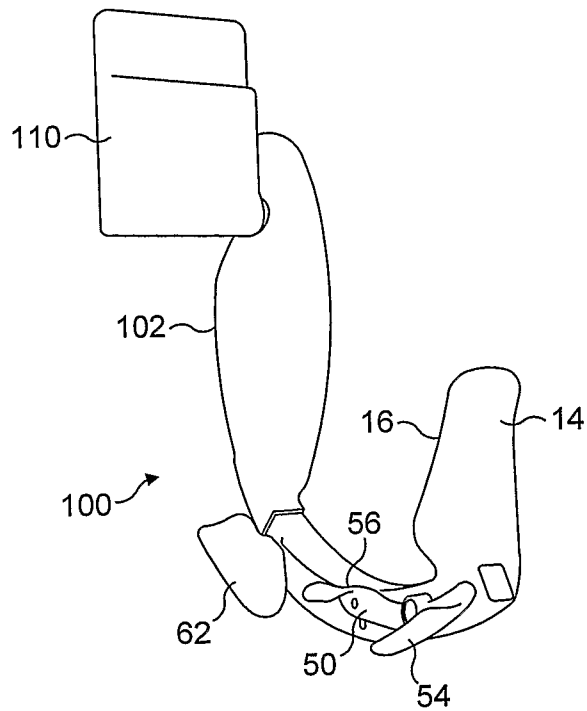


FIG. 12

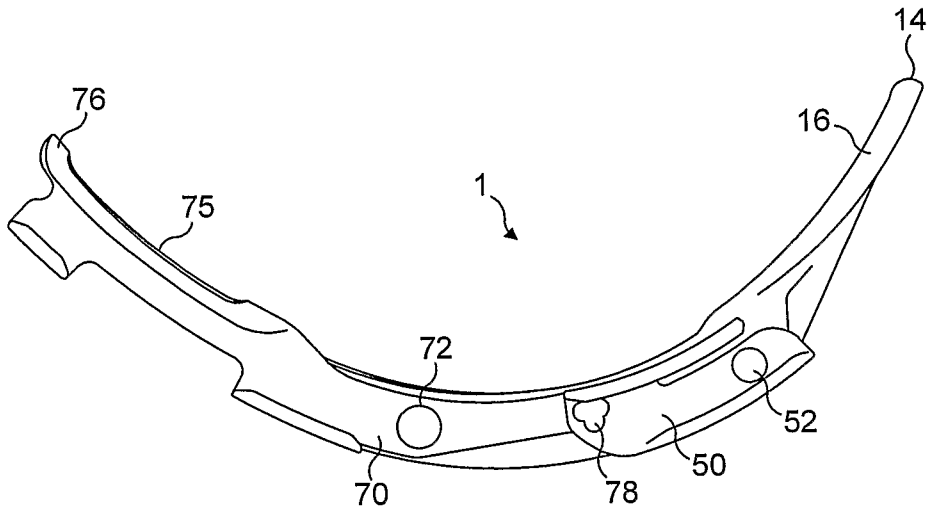


FIG. 13

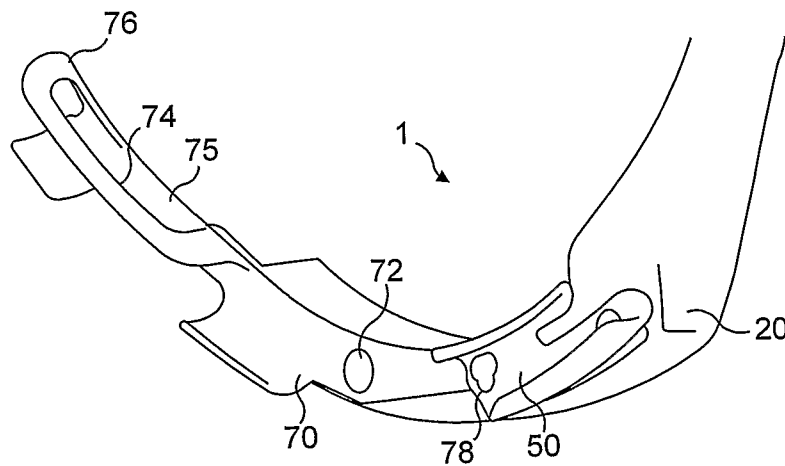


FIG. 14

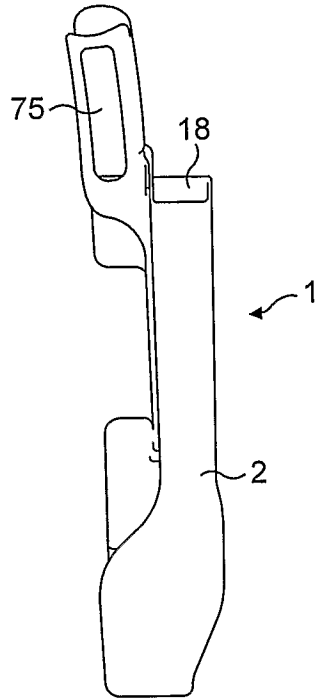


FIG. 15

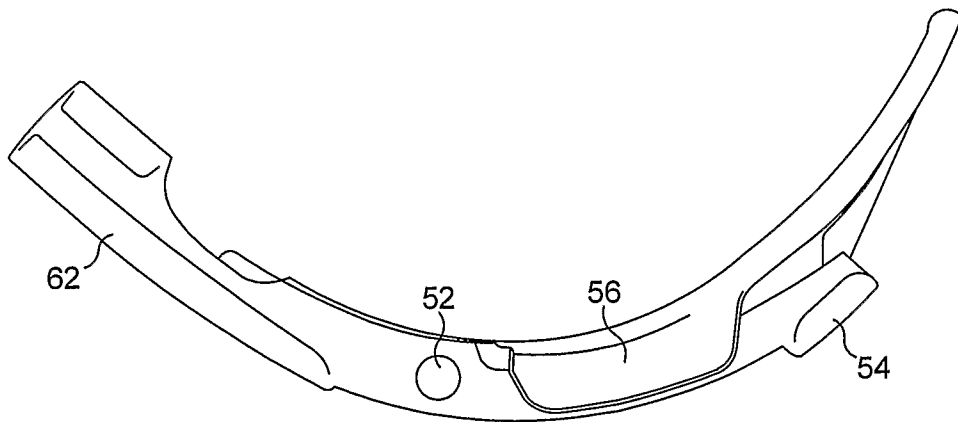


FIG. 16

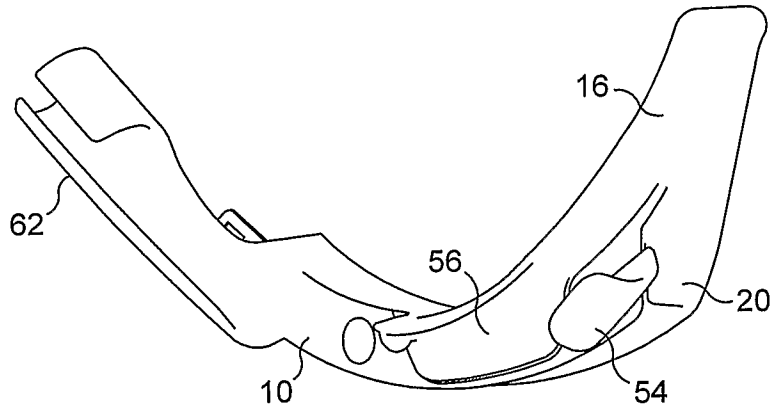


FIG. 17

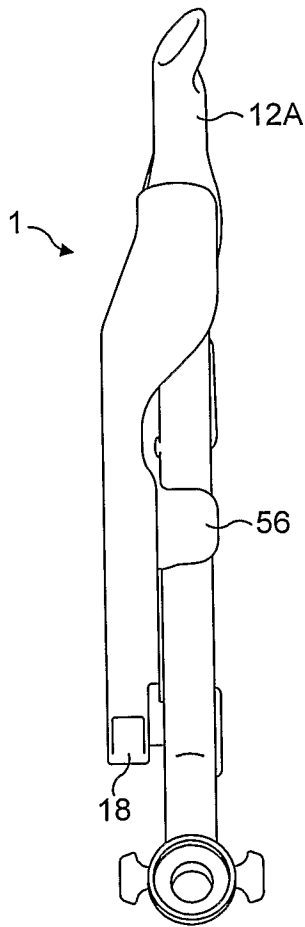


FIG. 18

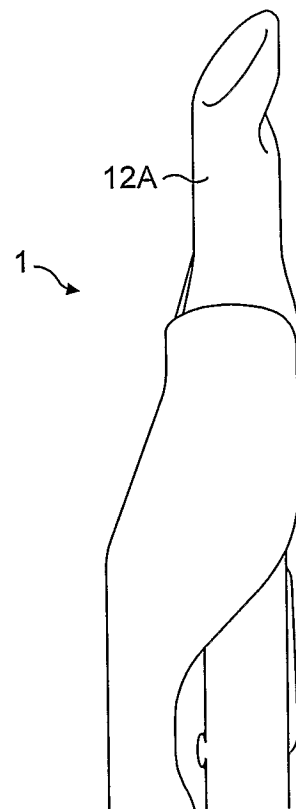


FIG. 19

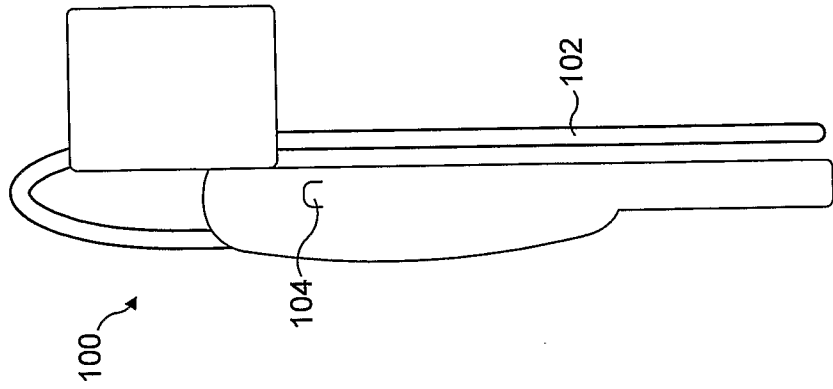


FIG. 20b

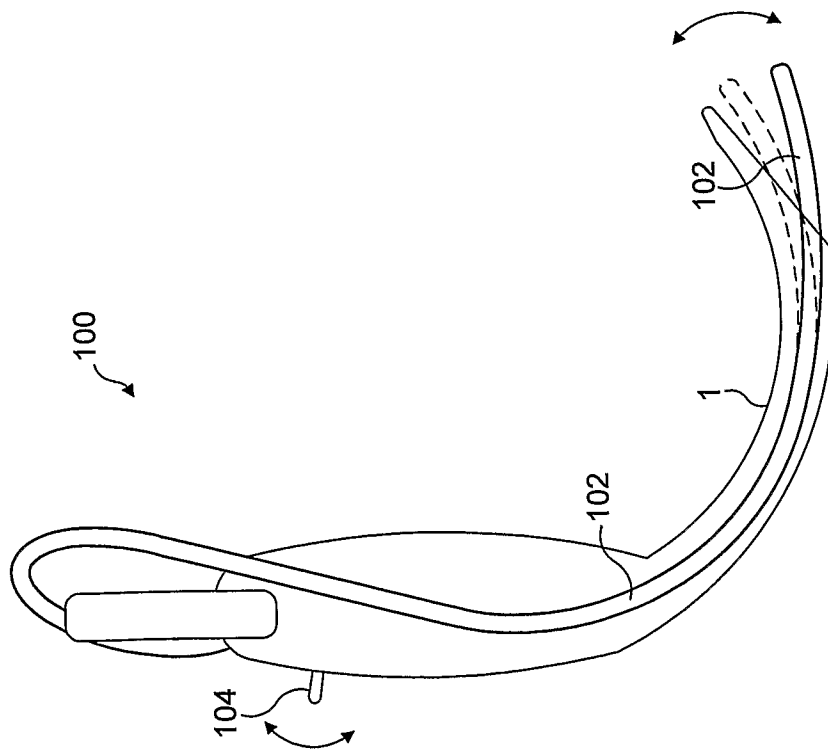


FIG. 20a

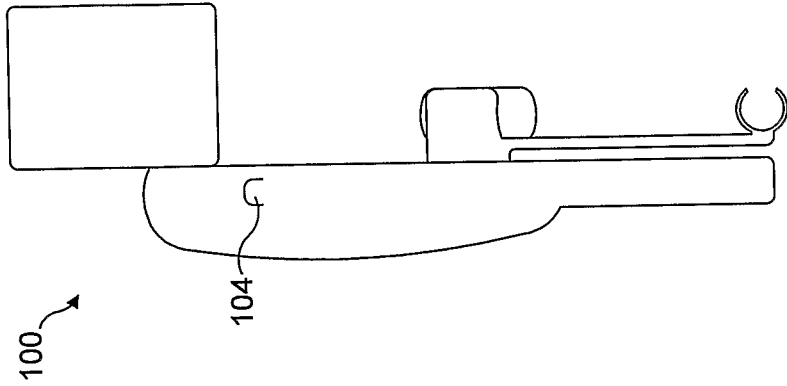


FIG. 21b

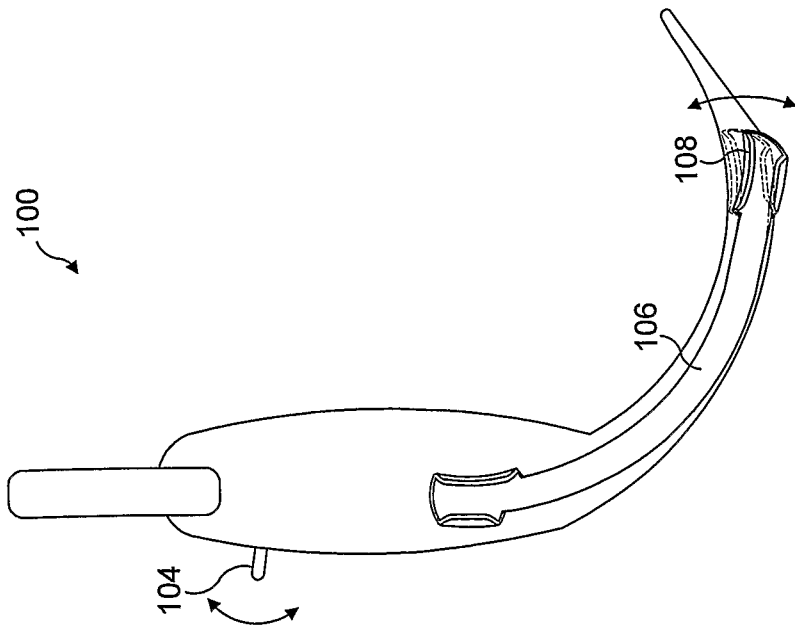


FIG. 21a

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2010/050379

A. CLASSIFICATION OF SUBJECT MATTER
 INV. A61B1/267 A61M16/04
 ADD.

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)
 A61B A61M G02B

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 practical, search terms used)
 EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/168059 A1 (PACEY JOHN A [CA]) 11 September 2003 (2003-09-11) abstract paragraph [0041] - paragraph [0046] paragraph [0049] - paragraph [0050] paragraph [0078] - paragraph [0080] figures 1,9-10,13	1-30
A	US 5 431 152 A (FLAM GARY H [US] ET AL) 11 July 1995 (1995-07-11) column 6, line 53 - line 56	27
A	WO 93/11700 A1 (VALENTI ELIO [IT]) 24 June 1993 (1993-06-24) abstract page 5, line 21 - line 28 figure 5	10-12, 17,29,30
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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.</p> <p>"&" document member of the same patent family</p>
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Date of the actual completion of the international search	Date of mailing of the international search report
3 June 2010	14/06/2010

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer <p style="text-align: center;">Marteau, Frédéric</p>
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INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2010/050379

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 337 761 A (UPSHER MICHAEL S) 6 July 1982 (1982-07-06) abstract column 7, line 60 - column 8, line 6 figures 13-14 -----	26

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Information on patent family members

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