A laryngoscope (10) includes a handle (14) and a separate disposable blade (18) which is designed to incorporate a number of specific features. One of these features resides in the way in which the blade is disengageably connected to its associated handle for the first time so as to damage a component of the blade sufficient to discourage its use a second time, but without preventing it from being used in the proper way the first time. In accordance with another feature, the blade includes an integrally formed main body (20, 22) which defines an open-ended passageway for containing a light guide (66). This passageway is configured so that the blade body including this passageway can be manufactured by means of an uncomplicated molding process.
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A LARYNGOSCOPE INCLUDING A SEPARATE DISPOSABLE BLADE AND ITS METHOD OF USE

The present invention relates generally to laryngoscopes and more particularly to a laryngoscope which utilizes a specifically designed disposable blade.

There are presently a number of generally similar types of laryngoscopes available in the prior art. The typical laryngoscope available includes an elongated handle, a separate blade for use on the handle, and an arrangement carried partially by the handle and partially by the blade for producing a beam of light in a predetermined direction relative to the blade. This latter arrangement utilizes a power supply contained within the handle for energizing a light source which produces the beam just recited. In most laryngoscopes, the light source is supported by and forms part of the blade, although in one type of laryngoscope presently being used the light source is carried by and forms part of the handle and cooperates with a light pipe on the blade. In either case, the handle and blade include cooperating means for disengagably connecting the two together so as to cause the power supply to energize the light source and cause the resultant beam to be pointed in the desired direction relative to the blade.

While laryngoscopes of the type described are generally satisfactory for their intended use, applicant has found
that continued use of the same laryngoscope blade (1) requires sterilization which can be a costly procedure and (2) can result in cross-infection between patients. Accordingly, a primary object of the present invention is to provide a laryngoscope including a blade which is specifically designed to be disposable.

Another object of the present invention is to provide a disposable laryngoscope blade which is economical to manufacture and reliable to use.

Still another object of the present invention is to provide a disposable laryngoscope blade and associated handle which are designed to cooperate with one another so as to specifically discourage use of the blade more than once, but without interfering with its proper use the first time.

Yet another object of the present invention is to provide a laryngoscope including a handle and a disposable blade of the above-mentioned type as well as a compatibly but economically provided arrangement for producing an associated beam of light for purposes of observation.

As will be described in more detail hereinafter, the laryngoscope disclosed herein includes a handle and a disposable blade. The handle has an elongated hand gripping portion and a blade connecting head portion and the blade includes a handle connecting segment and an elongated tongue holding segment connected with and extending out from the handle connecting segment. A first arrangement carried partially by the handle and partially by the blade are provided in order to produce a beam of light in a predetermined direction relative to the tongue holding segment of the blade for purposes of observation when the blade is connected with the handle in a specific way. A second arrangement forming parts of the handle and the blade cooperate to disengagably connect the two together so as to cause the observation beam to be produced.
In accordance with one feature of the present invention, the cooperating arrangement just recited not only causes the observation beam to be produced, but when the blade is connected to the handle for the first time this arrangement causes a component of the blade to be damaged sufficient to discourage use of the blade a second time without preventing it from being used in the proper way the first time.

In accordance with another feature of the present invention, the handle connecting and tongue holding segments of the blade are integrally molded as a single member which provides an elongated, open ended passageway configured to define an arc of a circle within a single plane. In this way, the passageway can be molded into the integral member using a core puller. A light guide is contained within the passageway and forms part of the arrangement for producing the previously recited beam of light. On the other hand, applicant has found that molding an integrally formed blade body with a passageway which defines an arc of a circle can be a relatively expensive task. Accordingly, as will be seen hereinafter, the present invention provides for a laryngoscope blade design designed in a way which minimizes this task.

Still a further object of the present invention is to provide a laryngoscope blade of the last-mentioned type and specifically one which includes a main body having a curved tongue holding segment and a light guide, at least a section of which corresponds generally in curvature to a section of the curved tongue holding segment.

A yet further object of the present invention is to provide a method of making the last-mentioned laryngoscope blade in an uncomplicated and economical way and yet a way which includes integrally forming its main body to include a curved tongue holding segment and means for supporting its associated light guide in a similarly curved fashion without utilizing one or more curved holes in the blade body.
As will be described in more detail hereinafter, the laryngoscope blade disclosed herein in accordance with the last-mentioned objects in mind is one which includes a handle connecting segment and an elongated, curved tongue holding segment connected with and extending out from the handle connecting segment. The blade also includes an elongated light guide, at least a section of which corresponds generally in curvature to a section of the curved tongue holding segment, and means for fixedly connecting the light guide to the handle connecting and tongue holding segments such that its curved section extends along and adjacent with the correspondingly curved section of the tongue holding segment. Moreover, the light guide is held in place without using a curved hole through either of the blade segments. Rather, in accordance with a preferred embodiment of the present invention, the two blade segments include respective straight passages for receiving opposite straight ends of the light guide in a way which causes an intermediate section of the latter to be supported in the necessary curved configuration. To this end, the light guide is sufficiently flexible to be bendable to different shapes but sufficiently rigid to hold its intended shape.

These and other features of the laryngoscope disclosed herein will be discussed in detail hereinafter in conjunction with the drawings, wherein:

FIGURE 1 is a side elevational view of a laryngoscope including a handle and disposable blade as well as other associated components designed in accordance with the present invention;

FIGURE 2 is a front longitudinal sectional view of the handle and certain associated components forming part of the laryngoscope of Figure 1;

FIGURE 3 is a partially broken away side elevational view of the handle and its associated components shown in Figure 2;
FIGURE 4 is an opposite side elevational view of a top portion of the handle illustrated in Figures 2 and 3;

FIGURE 5 is a side elevational view of the laryngoscope blade and certain associated components forming part of the laryngoscope of Figure 1;

FIGURE 6 is a top plan view of the blade and associated components illustrated in Figure 5;

FIGURE 7 is a bottom plan view of the blade and associated components shown in Figure 5;

FIGURE 8 is a front elevational view of the blade and associated components in Figure 5;

FIGURE 9 is a back elevational view of the blade and associated components shown in Figure 5;

FIGURE 10 is a partially broken away, side elevational view illustrating a top portion of the laryngoscope handle of Figure 1 and a back end segment of the blade showing how the latter is disengagably connected to the handle in accordance with the present invention;

FIGURE 11 is a view similar to Figure 10 but shows the laryngoscope blade in its disengagably connected position with respect to the handle;

FIGURE 11A is a view similar to Figure 11 but shows a prior art blade disengagably connected to the handle illustrated in Figures 2-4;

FIGURE 12 is a front elevational view of a top portion of a laryngoscope including a prior art handle and an arrangement for adapting the handle for use with the laryngoscope blade illustrated in Figures 5-9;
FIGURES 13-16 are various views of the adapter arrangement illustrated in Figure 12;

FIGURE 17 is a side elevational view of the laryngoscope blade designed in accordance with another embodiment of the present invention;

FIGURE 18 is a top plan view of the blade shown in Figure 17;

FIGURE 19 is a back end view of the laryngoscope blade illustrated in Figure 17;

FIGURE 20 is a front end elevational view of the laryngoscope blade illustrated in Figure 17;

FIGURE 21 is a plan view of the underside of the laryngoscope illustrated in Figure 17;

FIGURE 22 is an enlarged perspective view of a specific feature of the laryngoscope blade illustrated in Figure 17; and

FIGURE 23 is an enlarged perspective view of a modified version of the specific feature illustrated in Figure 22.

Turning now to the drawings, wherein like components are designated by like reference numerals throughout the various figures, attention is first directed to Figure 1 which illustrates a laryngoscope 10 designed in accordance with the present invention. This laryngoscope includes a handle 12 which may be divided into two functional portions, an elongated hand gripping portion 14 and a blade connecting head portion 16. The laryngoscope also includes a disposable blade 18 which is separate from the handle and which may be functionally divided into two segments, a handle connecting back end segment 20 and an elongated tongue holding segment 22 connected with and extending out from
segment 20. In addition to handle 12 and disposable blade 18, laryngoscope 10 includes a number of associated components which together form a first arrangement for producing a beam of light in a predetermined direction relative to the blade when the latter is connected to the handle in a specific way and a second arrangement forming part of the blade and part of the handle for disengagably connecting the two together in a way which (1) produces the beam and (2) discourages use of the disposable blade more than once.

Referring to Figures 2-4, 10 and 11 in conjunction with Figure 1, attention is directed to handle 12 and a number of components forming part of the beam producing arrangement just recited. As illustrated specifically in Figures 2 and 3, the hand gripping portion 14 includes an interior chamber 24 which is opened at the bottom end of the handle for receiving and containing two series connected batteries 26. The bottom end of the container is sealed by means of an end cap 28 having an inner electrically conductive section 29 which is electrically connected to an adjacent battery 26 by means of an electrically conductive spring member 30. The spring member also serves to urge the two batteries in a vertically upward direction (as viewed in Figure 2) against an electrically conductive contact 31 at the bottom opened end of a stem or sleeve member 32. This latter member is contained within a cooperating internal opening 33 in end portion 16 of handle 12 and extends partially into chamber 24 as seen in Figure 2. A top end section 32a of sleeve 32 and a corresponding top end section of opening 33 are threaded in order to maintain the sleeve in place. In this regard, the top of the sleeve is slotted (not shown) to facilitate a screwdriver. The top end of contact 31 engages a second electrically conductive spring 34 which is also disposed within sleeve 32 and which extends up through and along the entire length of the sleeve. The top end of spring 34 engages and supports an electrically conductive actuating pin 36 for movement between a biased extended position illustrated in Figure 2 (and by dotted lines in
Figures 10 and 11) and a retracted position illustrated by solid lines in Figures 10 and 11. When the pin 36 is in its extended position, it extends through a cooperating opening in the top end of sleeve 32. The batteries 26, section 29 of end cap 28 and its associated spring 30, the spring 34 and its associated actuator pin 36 together form part of the beam producing arrangement referred to above.

The beam producing arrangement also includes a suitable source of light, specifically the assembly generally indicated at 38 contained within a cooperating opening 40 in handle portion 16. Assembly 38 is composed of a conventional bulb 42 having a hot side contact 43 and a ground side contact (its body) contained within an electrically conductive grounding sleeve 44. The bulb body is maintained in electrical contact with the sleeve by means (not shown) within the sleeve. At the same time, contact 43 is engaged by a contact element 46 which is spring-loaded using the spring 48 and set screw 50, the latter also serving to close the back end of opening 40. The front end of opening 40 is left unobstructed so as to provide ready access to bulb 42. As illustrated in Figures 2 and 3, sleeve 44 is electrically connected to end cap section 29 by means of a ground wire 52 contained within and extending the length of handle 12 between the sleeve and end cap.

Referring specifically to Figures 10 and 11 in conjunction with Figure 2, the beam producing arrangement including the various components thus far described also includes a horizontally extending, fixed pin 54 which is disposed within a cooperating groove in the top of handle portion 16 and partially exposed at the top end of the handle. As best seen in Figure 2, the inwardmost end of pin 54 physically engages set screw 50 which means that pin 54 is in electrical contact with contact 46 which is in electrical contact with hot side contact 43 of bulb 42 and hence in electrical circuit with batteries 26 through the bulb filament and jacket and ground wire 52. Pin 54 is prefer-
ably threaded along its inward end section 58 adjacent set screw 50 and the opening in handle portion 16 containing this threaded end section is also threaded in a cooperating fashion. The opposite end of pin 54 is preferably slotted as seen in Figure 4 so that a standard screwdriver can be used to place the pin in its proper position.

Pin 54 not only forms part of the beam producing arrangement but also serves as part of the previously recited arrangement for disengagably connecting blade 18 to handle 12. To this end, and for the reasons to be discussed, pin 54 is circular in cross section and is disposed a predetermined distance behind pin 36, as best seen in Figures 10 and 11. As also seen in these latter figures, a second horizontally extending cylindrical pin 56 is supported on and forms part of handle 16 immediately in front of and slightly above vertical pin 36. Pin 56 also forms part of the blade connecting arrangement just mentioned. At the same time, it serves as part of an alternate electrical circuit including batteries 26, pin 36 and bulb 42 but not including pin 54, as will be discussed hereinafter. For this reason, one end of pin 56, specifically its threaded end 57 which is contained within a cooperating threaded opening in the handle portion 16 is retained in physical engagement with bulb sleeve 44. The other end of pin 56 is slotted in order to place it in its operating position.

Referring now to Figures 5-9, attention is directed to disposable blade 18. As stated previously, this blade includes a handle connecting segment 20 and an elongated tongue holding segment 22 connected with and extending out from the handle connecting segment. In a preferred embodiment, these two segments are integrally formed as a single member by means of injection molding or the like and may be constructed of any material compatible with its method of manufacture, preferably hard plastic, for example, polycarbonate. As best illustrated in Figures 6 and 8, tongue holding segment 22 may be divided into two lengthwise
sections, a tongue blocking and light guide holding section 58 forming a lengthwise side of segment 22 and a viewing and anesthesia tube guiding section 60 forming the other lengthwise side of the segment. Section 58 terminates rearwardly at a planar shoulder 62 (see Figures 7 and 9) which forms part of handle connecting segment 20. For reasons to become apparent hereinafter, shoulder 62 is disposed at an angle of about 30° with the vertical, that is, perpendicular to the axis of passageway 40 in blade connecting head portion 16 of handle 12 which means that shoulder 62 is perpendicular to the beam axis of light source assembly 38.

Section 58 of blade segment 22 includes an open ended, internal passageway 64 extending from the rearward end of the section at shoulder 62 to its front end which is best illustrated in Figure 8. This passageway is configured to define an arc of a circle (see Figure 5) which lies within a single plane (see Figures 6 and 7). This passageway serves to contain a light guide 66, for example, an optical fiber, a bundle of optical fibers, or the like, extending the entire length of the passageway. In an actual embodiment, a single rod of acrylic was used successfully. As will be seen hereinafter, light guide 66 cooperates with the light source 42 when blade 18 is connected with handle 12 for directing the beam produced by the light source in a predetermined direction relative to the blade, specifically, in the direction of arrow 68 illustrated in Figures 5 and 6. This light is used to illuminate a patient's throat during the initial anesthesiology workup while section 58 of the blade holds the tongue to one side. As a result, the anesthesiologist is provided with a clear view into the laryngeal area of the patient along section 60 and he may use this latter section as a guide to insert the anesthetic tube or tubes (not shown) into position.

The passageway 64 was described above as defining an arc of a circle. While blade 18 is not limited to this particular configuration, it is preferred for ease of manufacture when
the blade is of the Macintosh type, e.g., curved. More specifically, by making the passageway truly arcuate and particularly less than that of a half circle, passageway 64 can be molded into the blade segments 20 and 22 as these segments are molded into a single member using a suitable shaped core puller. This cannot be done if the passageway is not either straight or truly arcuate since the core puller could not be removed once a curved but not arcuate passageway is formed. Because of the desired arcuate configuration of passageway 64 and therefore light guide 66, the latter cannot be bent out of its arcuate configuration to better coincide with section 60 during observation of the patient's larynx. Therefore, as best illustrated in Figure 6, section 60 is designed to extend at an acute angle with section 58 so that the observation angle along section 60, as indicated by arrow 70, is at an acute angle with light beam 68. In this way, the light beam more efficiently illuminates the area being observed.

Having described segment 22 of blade 18 and its associated light guide 66, attention is now directed to segment 20. As illustrated in Figures 5 through 9, this segment includes a rearward projection 71 having a vertically extending, flat back end 72 which is positioned directly behind section 60 of blade segment 22. Directly below section 60 and joining back end 72 is a horizontally extending, flat bottom 74 which contains a downwardly opening slot 76 to be discussed below. Opposite back end 72 and extending up from bottom 74 is a front end 78 of blade segment 20. Front end 78 includes an inwardly extending and slightly downwardly angled slot 80 (see Figure 5) extending across its entire width (see Figure 7). The slot 76 also extends the entire width of projection 71 (again, see Figure 7) and for reasons to be discussed hereinafter, the cross sectional configuration of this latter slot defines an arc of a circle which is slightly greater than a half circle. The forward edge of this slot is designed to provide a relative sharp, knife edge 82 along a portion of its length from one end thereof. The
rest of the same edge is recessed as indicated at 84 therefore eliminating a cutting edge at that point. The entire slot 76 and a portion of bottom 74 are covered by an electrically conductive foil 86 bonded to bottom 78 or other electrically conductive means. For reasons to be discussed, the foil or other such means is readily severable in the way to be described.

Having now described laryngoscope blade 18 in its entirety from a structural standpoint, attention is directed to the way in which this blade is connected and interacts with handle 12, as best illustrated in Figures 10 and 11. As seen there, blade segment 20 is initially disposed over the top end of handle 12 at an angle with the latter. Pin 56 forming part of the blade connecting head portion 16 is located in slot 80 and is used as a means for pivoting the blade between the angled position illustrated in Figure 10 and the flat operating position illustrated in Figure 11. As blade segment 20 moves from its Figure 10 position to its Figure 11 position, a front end of foil 86 engages against and remains in contact with pin 36 as the latter is pushed down into its retracted position. At the same time, slot 76 is forced into snap fitting engagement around pin 54. In this latter regard, as stated previously, the diameter of slot 76 is approximately equal to the diameter of pin 54 but the cross section of the slot is greater than a half circle. Moreover, projection 71 which is preferably plastic is sufficiently resilient to provide a limited degree of give to slot 76 so that the latter can snap around and interlock with pin 54 upon application of sufficient force. At the same time, cutting edge 82 sever a corresponding length of the foil (or other such means) across the width of the latter. However, because of recess 84, foil 86 is not entirely severed. Thus, with blade 18 mounted on handle 12 in the manner illustrated in Figure 11, foil 86 serves as an electrical connection between pins 36 and 54. This, in turn, closes the electrical circuit between batteries 26 and light bulb 42 causing the latter to be energized for produc-
ing a beam of light. At the same time, the foil is sufficiently damaged as a result of being partially severed so as to discourage anyone from using the disposable blade a second time. While foil is preferred to accomplish this, it is to be understood that other means serving the same function could be used.

From the foregoing, it should be apparent that the pins 36, 54 and 56 form a part of handle portion 16 and the slots 76 and 80 and foil 86 forming part of blade segment 20 cooperate with one another for disengagably connecting the disposable blade to the handle in a specific way so as to energize light bulb 42. At the same time, when the blade is used for the first time, a component thereof is damaged, specifically foil 86, sufficient to discourage anyone from using the blade a second time, but without preventing it from being used in the proper way the first time. In addition, placement of the laryngoscope blade on its handle in the appropriate way automatically places planar shoulder 62 and the back end of light guide 66 in confronting relationship with and across the front of opening 40 and light bulb 42. In this way, light guide 66 is able to capture and collect substantially all of the light beam passing out of the opening 40 from the light bulb for directing this beam in the direction of arrow 68. This is accomplished without having to provide a 90° bend in the light guide and yet the light is ultimately directed in the most beneficial direction relative to blade segment 22. Moreover, this has been found most easily accomplished by orienting opening 40 and therefore the axis of the light beam leaving this opening at an angle of 30° with a plane normal to the axis of handle portion 14, that is, with the horizontal when the handle portion is held in a vertical direction.

Having described laryngoscope 10, it should be apparent that the blade 18 can be made relatively economically by molding the segments 20 and 22 as a single integral member with the passageway 64 being formed of the same time. In this way,
in order to complete the blade, all that is necessary is that the light guide be inserted into the passageway and that the foil 86 be adhered to bottom 74 of projection 71. Moreover, all of these components are relatively inexpensive and therefore the overall blade is disposable after a single use. To this end, by partially severing the foil when the blade is first used, its user is encouraged to dispose of it thereafter.

Because of the way in which blade 18 is designed, handle 14 is different than the typical prior art handle, at least to the extent that handle 14 includes pin 54 in circuit with batteries 26 and bulb 42. In the typical prior art handle, no such pin exists. Rather, the prior art handle utilizes a pin corresponding to pin 56 (and the rest of the blade body) in conjunction with a pin corresponding with pin 36 to close the electrical circuit between its batteries and associated light source and the latter is typically carried by the blade rather than the handle. In this latter case, the light source is connected in circuit with an insulated button on the blade which makes contact with pin 36. At the same time, the rest of the blade including pin 56 makes contact with the handle body and serves as a ground. Figure 11A illustrates the back end of a conventional metal laryngoscope blade generally indicated at 90. The handle connecting back end segment of this blade includes a front slot 92 corresponding to previously described slot 80, a back end 94 and a bottom 96. This handle connecting segment can be mounted to the top end of handle 12 by placing pin 56 in slot 92 and pivoting the blade about the axis of this latter pin until the bottom 96 rests against pin 36 and causes this pin to move to its retracted position. This, in turn, incorporates the batteries 26 into and closes an electrical circuit including a light source associated with and carried by the blade 90 for energizing the light source. However, it should be noted that the pin 54 is positioned relative to pin 36 such that the back end 94 of blade 90 does not engage this rearward pin. Therefore, when prior art blade 90 is
-15-
disengagably connected to handle 12, bulb 42 carried by the handle is not energized and therefore does not unnecessarily drain the batteries or needlessly withdraw power from the other, intended light source.

Having described the way in which handle 12 forming part of a laryngoscope 10 cooperates with a prior art blade, attention is now directed to the way in which the prior art handle can be readily converted to one which will operate with blade 18 in the same manner as handle 12. The top end of this prior art handle is generally illustrated in Figure 12 at 98. While not shown, the bottom end of the handle may be identical to handle portion 14 and includes similar batteries 26. The top end of the handle includes a pin 100 which corresponds to pin 56 of handle 12 that is, it is the pin which is disposed within the slot corresponding to slot 92 of prior art blade 94. While not shown, this conventional handle also includes a vertically extending pin and associated component corresponding to pin 36 and components 32 and 34 (see Figure 2). However, in order to adapt handle 98 to include blade 18, this latter pin and its associated components are removed and entirely eliminated and the pin 100 is temporarily disassembled from the blade connecting head portion 102 forming the top end of the handle. This leaves a pair of spaced apart flanges 104 having aligned through holes 107 extending vertically upward at the top end of the handle across which pin 100 is supported. With the pin disassembled therefrom, a threaded opening 106A into the base 106 of portion 102 is made accessible. This opening extends all the way down to the chamber in the handle containing the batteries corresponding to batteries 26.

With portion 102 of handle 98 in the condition just recited, an adapter generally indicated at 108 is mounted on and connected with the handle portion. This adapter may be separated into two components, a main body 108A shown alone in Figure 15A and a shaft arrangement 108B shown alone in Figure 15B. Main body 108A includes a lowermost base
section 110 (see Figures 13 and 15A) which includes a vertically extending unthreaded through hole 111, which fits snugly between flanges 104 (see Figure 12) and which includes a horizontal through hole 112 in alignment with the through holes 107 of flanges 104. In this way, the pin 100 can be reassembled into its cooperating openings 107 and, at the same time, through opening 112 for holding the adapter in place. Also, the hole 111 is automatically placed in vertical alignment with and above threaded hole 106A in the handle.

As best illustrated in Figures 14, 15B and 16, shaft arrangement 108B includes its own vertically extending pin 114 corresponding in function to pin 36 disposed within a sleeve 116 corresponding to sleeve 32. As seen in Figure 15B, the sleeve 116 includes an enlarged head 116A which is slotted at 117 (see Figure 16), an intermediate section 116B which is threaded at 119 and a narrower bottom portion 116C. A spring 118 is also located within sleeve 16 between pin 114 and a lowermost contact 120 which is thread connected into and through a cooperating threaded opening 122 in the bottom of sleeve 116. The lowermost unthreaded end of sleeve 116 is provided for maintaining pin 114 in electrical contact with the batteries in handle 98 when the adapter is in place on top of the handle. In this regard, the bottom portion 116C and the threaded section 119 of portion 116B of the shaft 116 are placed through hole 111 in main body 108A. The threaded section 119 cooperates with threaded hole 106A in base 106 of handle 98 so that contact 120 engages the batteries in the handle. In this latter regard, the slot 117 in enlarged head 116A is used to thread connect section 119 with threaded opening 106A until the head moves into a cooperating recess 131 in main body 108A (see Figure 15A). Thus, the bottom threaded section 119 of sleeve 116 in Figure 15 is thread connected into the opening in base 106 for connecting the adapter to the handle. Pin 114, the spring 118 and contact 120 together function in the same manner as the pin 36 and its associated components 31, 32.
Referring specifically to Figures 12-14, the adapter's main body 108A is shown including a light source assembly 120 which may be identical to the previously described assembly 44. Thus, assembly 120 includes a metal grounding sleeve 122, contained within an open ended passageway 124 in the adapter and housing the light bulb 126 which remains in place by means of a shoulder at its forwardmost end. A hot side contact 129 on the bulb, a contact 128, an associated spring 130 and adjacent set screw 132 are provided and correspond to the components 43, 46, 48 and 50 in Figure 3. In addition, the adapter includes a grounding rivet 134 which contains and is in electrical contact with a spring 136. The spring also engages against sleeve 122, thus placing the ground side of light bulb in electrical contact with the sleeve.

In addition to the various components thus far described, adapter 108 includes a front pin 138 disposed in front of and slightly above pin 114 (see Figure 14) and a back pin 140 positioned directly behind pin 114. The pin 138 corresponds in function and structure to previously described pin 56 and the pin 140 corresponds in function and structure to pin 54. In other words, the three pins 114, 138 and 140 respectively serve the same purposes as the pins 36, 56 and 54 in supporting laryngoscope blade 18. In order to provide the appropriate electrical connections between these various components, the pin 138 is designed to engage the rivet 134 as illustrated in Figure 12. This places pin 138 in electrical contact with sleeve 122 and therefore the ground side of bulb 126. The pin 140 physically engages the set screw 132 (see Figure 14), thereby placing pin 140 in electrical contact with the hot side contact 127 of bulb 126. By providing the combination rivet 134 and spring 136, it is not necessary to directly engage against sleeve 122 with pin 138, thereby minimizing damage to the latter. This is also true for pin 40 which engages the set screw 132 rather than
sleeve 122.

Turning now to Figures 17-23, wherein like components are designated by like reference numerals throughout the various figures, attention is first directed to Figure 17 which illustrates a laryngoscope blade 10' designed in accordance with the present invention. The blade is shown in Figure 17 including a main body 12', an elongated light guide 14' and a strip of electrically conductive material 16'. Each of these components functions in the manner to be described hereinafter. For purposes of description, the laryngoscope body 12' may be separated into two segments, a handle connecting back segment 18' and an elongated, curved tongue holding forward segment 20' connected with and extending in front of segment 18'.

As seen best in Figures 17 and 21, electrically conductive strip 16' which is, for example, metal foil extends across and is connected with the bottommost, downwardly facing surface 22' forming part of handle connecting segment 18'. The strip covers a longitudinal portion of a slot 24' and indent 26' extending into segment 18 from surface 22'. Segment 18' is also shown including a second slot 28' located above surface 22' and facing in the forward direction under tongue holding segment at a slightly upward incline. Strip material 16' in cooperation with slots 24' and 28' and indent 26' serve to disengagably connect the handle connecting segment 18' to a cooperating blade connecting head portion forming part of a laryngoscope handle (indicated by dotted lines in Figure 17) in the manner described above (see Figures 1-16). It should suffice to say that these components and the particular way in which the blade is connected to the handle and the handle itself (also disclosed in the co-pending application just mentioned) do not form part of the present invention. In this regard, it is to be understood that the laryngoscope blade designed in accordance with the present invention could be readily designed to include a different means of connection.
with a cooperating handle and may or may not include strip material 16 and the combination of slot 24' and indent 26' which together are intended to discourage a person from using the blade more than once.

5 In accordance with the present invention, laryngoscope body 12' is an integrally formed member consisting of handle connecting segment 18' and tongue holding segment 20'. In a preferred embodiment, the body is suitably molded from plastic, although it could be constructed of stainless steel or other metals. As seen best in Figure 17, the tongue holding segment defines an arcuate path from its back end to its front end so as to be readily insertable into the throat of a patient. For reasons to be discussed below, this arcuately shaped segment includes an elongated pocket 30 which extends into but not entirely through one side of segment 20'. This pocket is defined by a forwardly facing inclined back wall 32 forming part of segment 18', a rearwardly facing inclined front wall 34', an innermost side wall 36 and a downwardly facing top wall 38', the latter three walls forming part of segment 20'.

As illustrated in the various figures, an open-ended, straight hole 40' extends between front wall 34' and the front face of tongue holding segment 20' (see Figure 20). This hole is circumferentially closed along its entire length and extends at an acute angle upwardly from its front end to its back end. A second open-ended, straight hole 42' is provided and extends between back wall 32' and a rearward face 44' forming part of segment 18'. This latter opening is best illustrated in Figure 22 and is shown extending at an acute angle upwardly from its back end to its front end. In addition, a slot 46' defined by ramped surface 48' extends into opening 42' from one side thereof.

The holes 40' and 42' serve to maintain the previously recited light guide 14' in a fixed position on body 12' of the laryngoscope body. More specifically, hole 40' serves
to receive a straight front section 50 of the light guide while hole 42' serves to receive a straight back end section 52'. Since the light guide is flexible and because of the relative positions of holes 40' and 42' relative to one another and to the rest of the laryngoscope body, an intermediate section 54' of the light guide is disposed within pocket 30' and maintained in a curvilinear configuration corresponding to and extending along and adjacent to a section of the curved tongue holding segment 20', as best illustrated in Figure 17. Because the openings 40' and 42' are straight, the entire laryngoscope body can be molded as an integral member much more economically than if arcuate holes are used, as in the case of the laryngoscope blade illustrated in Figures 6-9.

Having described laryngoscope blade 10', attention is now directed to one way in which light guide 14' is assembled with body 12'. The first step in this preferred process is to insert front end section 50' of the light guide into hole 40' until the front end of the light guide is approximately flush with the front end of the hole. Thereafter, intermediate section 54' is bent into the curved configuration illustrated so as to place the rearwardmost end of the light guide against ramp 48' of slot 46'. The back end of the light guide is then forced inward along the ramp until back section 52' of the light guide snaps into hole 42'. The light guide will remain in this position. When the blade is mounted to its associated laryngoscope handle in the normal operating manner, the back end of light guide 14' is automatically placed in optical alignment with the light source carried by the handle which is automatically energized by a power supply in the handle as described in the Figure 1-16 embodiment above. In this way, the light guide serves to redirect light from its optically aligned source toward its front end. This light passes out the front end of the light guide and is used to illuminate an area in advance of the blade as the latter is inserted into a patient's throat, as more fully described in the previously recited co-pending
application. In accordance with another, preferred way of assembling light guide 14', the latter is initially molded or otherwise formed into its ultimate shape shown in Figure 17. In this way, the straight front end section 50' can be inserted entirely into hole 40' until reaching the already curved section 54'. The back end of the light guide can then be assembled into place.

Referring to Figure 23, the hole 42' is shown including a modified slot 46". This latter slot extends the entire length of hole 42 and therefore does not include a ramped surface 48. Moreover, the slot 46" is slightly smaller vertically than the diameter of hole 42'. In this way, the back end section 52' of light guide 54' can be snapped into hole 42' through slot 46" without being forced to ride on a ramped surface such as the one illustrated in Figure 22. Of course, in order to force end section 52' through slot 46", either the material making up blade segment 18', at least around the slot, must provide sufficient resiliency to allow the slot to be expanded outward or section 52' of the light guide must be sufficiently resilient or compressible to adequately deform or compress sufficient to pass through the slot. In either case, it is assumed that the cross sectional configuration of end section 52' is larger than the vertical dimension of the slot which is preferable so that the end section cannot inadvertently slip out of opening 42' once in place therein.

While laryngoscope body 12' has been described including a straight, circumferentially closed opening 40' and a slotted opening 42', it is to be understood that two straight openings entirely closed circumferentially could be provided or two slotted openings could be used. Moreover, the light guide does not have to be flexible, although this is preferred for ease of assembly. It is only necessary that the holes, whether they are slotted or not, be straight so as to make the manufacture of the blade by means of molding relatively easy.
What is Claimed is:

1. A laryngoscope comprising:
   (a) a handle including an elongated hand gripping portion and a blade connecting head portion;
   (b) a disposable blade separate from said handle and including a handle connecting segment and an elongated tongue holding segment connected with and extending out from said handle connecting segment;
   (c) means carried partially by said handle and partially by said blade for producing a beam of light in a predetermined direction relative to the tongue holding segment of said blade when said blade is connected with said handle in a specific way; and
   (d) first and second cooperating means respectively forming parts of the head portion of said handle and the handle connecting segment of said blade for disengagably connecting said disposable blade to said handle in said specific way for the first time so as to cause said beam to be produced and so as to damage a component of said disposable blade sufficient to discourage its use a second time without preventing it from being used in the proper way the first time.

2. A laryngoscope according to Claim 1 wherein said beam producing means includes a light source and a power supply and wherein said first and second cooperating means disengagably connect said blade to said handle in said specific way for the first time so as to place said power supply in electrical circuit with said light source in order to produce said beam, said first and second cooperating means including a readily severable, electrically conductive member forming part of the electrical circuit between said power supply and said light source and means for severing a substantial part of said electrically conductive member as said blade is disengagably connected to said handle in said specific way for the first time.
3. A laryngoscope according to Claim 2 wherein said electrically conductive member is a relatively thin, elongated strip of metal foil which extends between the head portion of said handle and the handle connecting segment of said blade when the latter is connected to said handle in said specific way.

4. A laryngoscope according to Claim 3 wherein said first cooperating means includes first and second electrically conductive circuit means forming electrically spaced-apart junctions in said electrical circuit and wherein said strip of foil forms part of said second cooperating means so as to electrically connect said junctions together when said blade is connected to said handle in said specific way.

5. A laryngoscope according to Claim 4 wherein said first circuit means includes a fixed pin serving as one of said junctions and wherein said second cooperating means includes a groove on the opposite side of said foil as said pin, said groove cooperating with said pin to carry out said severing of said foil while at the same time disengagably connecting said blade to said handle in said specific way.

6. A laryngoscope according to Claim 5 wherein said pin has a circular cross section defined by a given radius and wherein the cross section of said groove is defined by an arc of a circle having approximately the same radius, said arc being sufficiently greater than a half-circle and the groove itself being slightly resilient whereby the groove can interlock around the pin, said groove also providing a cutting edge for severing said foil, said cutting edge being shorter than the width of said foil.

7. A laryngoscope according to Claim 1 wherein said beam producing means includes a power supply and a light source carried by said handle and a light guide fixedly held by and extending between said head connecting and tongue holding segments of said blade so as to be placed in optical align-
ment with said light source for directing said beam in said predetermined direction when said blade is connected to said handle in a specific way.

8. A laryngoscope according to Claim 7 wherein said blade segments are integrally formed as a single member having an elongated, open ended passageway configured in an arc of a circle disposed in a single plane, and wherein said light guide is formed from at least one elongated optical fiber and contained within said guideway.

9. A laryngoscope according to Claim 8 wherein said integrally formed member is molded plastic.

10. A laryngoscope according to Claim 8 wherein the tongue holding segment of said blade includes a section which extends at an acute angle with said light guide so as to cooperate with said light beam for exposing a patient's throat to view when the laryngoscope is in use and, at the same time, to illuminate the patient's throat with said beam.

11. A laryngoscope according to Claim 8 wherein the end of said light guide adjacent the handle connecting segment of said blade is flat and extends normal to and coaxial with the axis of said light source when said blade is connected with said handle in said specific way.

12. A laryngoscope according to Claim 8 wherein said handle is substantially straight and wherein said light source is positioned relative to said handle so that its axis is disposed at a 30° angle with plane normal to said handle.

13. A laryngoscope according to Claim 7 including an additional blade having its own tongue holding segment carrying its own light source and a handle connecting segment including means for disengagably connecting said
additional blade to said handle in a way which places said last mentioned light source in circuit with said power supply without placing said first mentioned light source in electrical circuit with said power supply.

14. A laryngoscope according to Claim 1 wherein the blade connecting head portion of said handle is disengagably connected to the hand gripping portion of said handle, said head portion serving as an adapter for handles having original blade connecting head portions which are incompatible with said disposable blade.

15. A laryngoscope according to Claim 14 wherein said hand gripping handle portion includes a threaded opening extending therein from its top end and wherein said head portion includes an elongate hollow at least partially threaded shaft extending into and in threaded engagement with said threaded opening in said handle gripping portion.

16. A laryngoscope according to Claim 15 wherein said beam producing means includes a power supply contained within said hand gripping handle portion below its threaded opening and wherein said shaft contains longitudinally electrical contacts at opposite ends thereof and an electrically conductive spring therebetween, the lowermost one of said contacts being in contact with said power supply for placing the other contact in circuit therewith.

17. A laryngoscope according to Claim 16 wherein said head portion includes a main body having a threaded opening therethrough for containing said shaft in thread connection therewith.

18. A laryngoscope comprising:
   (a) a handle including an elongated hand gripping portion and a blade connecting head portion;
   (b) a blade separate from said handle and including a handle connecting segment and an elongated tongue holding
segment which are integrally formed as a single member, said member containing an elongated, open ended internal passageway which is configured to define an arc of a circle disposed within a single plane;

(c) means carried partially by said handle and partially by said blade for producing a beam of light in a predetermined direction relative to the tongue holding segment of said blade when the latter is connected with said handle in a specific way, said beam producing means including a light source and a power supply carried by said handle for producing a beam of light and a light guide disposed within and extending the length of said open ended, internal passageway, the latter being designed to place said light guide in optical alignment with said light source for directing said beam in said predetermined direction when said blade connected to said handle in said specific way; and

(d) first and second cooperating means respectively forming parts of the head portion of said handle and the handle connecting segment of said blade for disengagably connecting said blade to said handle in said specific way so as to cause said beam to be produced.

19. A laryngoscope according to Claim 18 wherein said integrally formed member making up said blade segments is constructed of molded plastic.

20. A laryngoscope according to Claim 18 wherein the tongue holding segment of said blade includes a section which extends at an acute angle with said light guide and cooperates with said beam so as to expose a patient's throat to view when the laryngoscope is in use and, at the same time, to illuminate the patient's throat with said beam.

21. A disposable blade for use as part of a laryngoscope which also includes a handle having an elongated hand gripping portion and a blade connecting head portion, said disposable blade comprising:
(a) a handle connecting segment including means designed to cooperate with the blade connecting head portion of said handle for disengagably connecting the blade to the handle in a specific way so that when said blade is connected to said handle in said specific way for the first time a component of said blade is damaged sufficient to discourage use of the latter a second time, but without preventing it from being used in the proper way the first time;

(b) an elongated tongue holding segment connected with and extending out from said handle connecting segment; and

(c) means carried by said blade and designed to cooperate with said handle for directing the beam of light in a predetermined direction relative to said tongue holding segment.

22. A disposable blade according to Claim 21 wherein said blade component is a strip of electrically conductive metal foil connected with said handle connecting segment so as to be engagable against the blade connecting head portion of said handle when said blade is connected to said handle and wherein said connecting means forming part of said handle connecting segment includes means for severing a portion of said foil.

23. A disposable blade according to Claim 22 wherein said connecting means forming part of the handle connecting segment of said blade includes a groove across which said foil extends, said groove including one edge serving as said severing means.

24. A disposable blade for use as part of a laryngoscope which also includes a handle having an elongated gripping portion and a blade connecting head portion, said disposable blade comprising:

(a) a handle connecting segment including means designed to cooperate with the blade connecting head portion of said handle for disengagably connecting the blade to said
-28-
handle;
(b) an elongated tongue holding segment integrally connected with and extending from said handle connecting segment; and
(c) means forming parts of said handle connecting and tongue holding segments for containing an elongated light guide, said containing means including an open ended passage-way extending through sections of said handle connecting and tongue holding segments, said passage-way being configured to define an arc of a circle, less than half a circle, within a fixed plane relative to said segments.

25. A disposable blade according to Claim 24 wherein said handle connecting and tongue holding segments are integrally formed into a single member from molded plastic.

26. In a laryngoscope including a handle and a disposable blade disengagably connectable to said handle, a method of using said blade for the first time, said method comprising the steps of:
(a) providing said blade with a segment designed to be disengagably connected with said handle and a component intended to be damaged;
(b) disengagably connecting said blade to said handle for the first time so as to damage said component sufficient to discourage the use of said blade a second time, but without preventing it from being used in the proper way the first time.

27. A laryngoscope, comprising:
(a) a handle having a hand gripping portion and a blade connecting head portion, said head portion including first and second electrically conductive members and dielectric means for electrically insulating said members from one another;
(b) a laryngoscope blade separate from said handle and having a handle connecting segment including means defining an electrically conductive path and an elongated tongue.
holding segment connected with and extending out from said handle connecting segment;

(c) first and second cooperating means respectively forming parts of the head portion of said handle and the handle connecting segment of said blade for disengagably connecting said blade to said handle in a specific way which automatically causes said electrically conductive path defining means to engage and electrically connect together said first and second members;

(d) an electrical light source carried by said handle;

(e) a power supply carried by said handle for energizing said light source when placed in electrical connection with the latter; and

(f) circuit means including said first and second electrically conductive members electrically connected with said light source and power supply in a predetermined way and said electrically conductive path defining means for automatically placing said power supply in electrical connection with said light source in order to energize the latter when said first and second members are electrically connected together by said path defining means, whereby disengagably connecting said blade to said handle in said specific way automatically causes said light source to be energized.

28. A laryngoscope according to Claim 27 wherein the hand gripping portion of said handle defines an inner chamber containing said power supply, wherein said first electrically conductive member includes a pin and means extending into said chamber for electrically connecting said pin with said power supply, and wherein said second electrically conductive member includes a bar and means for electrically connecting the latter with said light source.

29. A laryngoscope according to Claim 28 wherein said bar also serves as part of said first cooperating means for disengagably connecting said blade to said handle.
30. A laryngoscope according to Claim 27 wherein said blade has a dielectric main body and an electrically conductive strip of material attached thereto serving as said electrically conductive path defining means.

31. A laryngoscope according to Claim 27 wherein said first cooperating means for disengagably connecting said blade to said handle includes a third electrically conductive member electrically insulated from said first and second members, wherein said circuit means includes means for connecting said first and third member in circuit with said power supply such that when said first and third members are electrically connected across a second light source carried by a different laryngoscope blade, the second source is automatically energized by said power supply, whereby said different blade can be connected to said handle for electrically connecting said first and third members together.

32. A laryngoscope according to Claim 27 wherein said blade connecting head portion of said handle is an arrangement separate from said hand gripping portion but disengagably connected therewith.

33. A laryngoscope according to Claim 32 wherein the hand gripping portion of said handle includes a threaded opening and wherein said blade connecting portion includes a threaded stem thread connected into said opening for disengagably connecting said blade connecting head portion with said hand gripping portion.

34. A laryngoscope, comprising:
   (a) a handle having a hand gripping portion including an inner chamber and a blade connecting head portion, said head portion including first, second and third electrically conductive members electrically insulated from one another;
   (b) a laryngoscope blade separate from said handle and having a handle connecting segment including means defining an electrically conductive path and an elongated tongue.
holding segment connected with and extending out from said handle connecting segment, said blade also including a light guide having a back end located at its handle connecting segment and a front end located at the tongue holding segment, said light guide being adapted to receive light at its back end for directing the received light to its front end;

(c) first means and second cooperating means respectively forming parts of the head portion of said handle and the handle connecting segment of said blade for disengagably connecting said blade to said handle in a specific way which automatically causes said electrically conductive path defining means to engage and electrically connect together said first and second members and which, at the same time, automatically places said light guide in a predetermined position relative to the blade connecting head portion of said handle, said first means including said second and third members;

(d) an electrical light source carried by the blade connecting head portion of said handle and positioned so as to be in optical communication with the back end of said light guide when said blade is connected to said handle in said specific way;

(e) a power supply disposed within the inner chamber of said handle for energizing said light source when placed in electrical connection therewith; and

(f) circuit means for electrically connecting said light source and power supply to ground, for electrically connecting said first member to the hot side of said power supply, and for electrically connecting said second member to the hot side of said light source so that said power supply is automatically placed in electrical connection with said light source in order to energize the latter when said first and second members are electrically connected together by said electrically conductive path defining means, whereby disengagably connecting said blade to said handle in said specific way automatically causes said light source to be energized and disengagement of said blade from said handle automatically causes said light source to be de-energized.
35. A laryngoscope according to Claim 34 wherein said circuit means includes means for electrically connecting said third electrically conductive member to the ground side of said power supply such that when said first and third members are electrically connected across a different light source, the latter is automatically energized by said power supply, whereby a second type of blade including said second light source and means for engaging said handle in a way which electrically connects said first and third members can be connected with said handle in said last-mentioned way for automatically energizing said second light source when said first-mentioned blade is not connected with said handle.

36. A laryngoscope according to Claim 35 including said second blade and wherein said second blade is configured and said electrically conductive member are positioned such that connecting said second blade to said handle in said specific way does not electrically connect said second member with said first member, whereby said first-mentioned light source remains de-energized.

37. A laryngoscope according to Claim 35 wherein the blade connecting head portion of said handle is separate from said hand gripping portion, wherein said hand gripping portion includes an opening which is partially threaded and which extends into said inner chamber from one end and wherein said blade connecting head portion includes a main body having an opening therethrough and a sleeve at least partially externally threaded extending through said last-mentioned opening and into the opening in said hand gripping portion for thread connection with the latter, said sleeve including means for engaging said main body so as to disengagably connect the latter with said hand gripping portion, said sleeve also containing said first member and means for placing the latter in electrical engagement with said power supply.
38. A laryngoscope, comprising:
   (a) a laryngoscope blade having a handle connecting segment and an elongated tongue holding segment connected with and extending out from said handle connecting segment;
   (b) a handle including
      (i) a hand gripping portion having a top end, a bottom end, an inner chamber for containing a power supply and an opening which extends from its top end into said chamber and which includes a threaded segment along its length, and
      (ii) a blade connecting head portion including a main body defining an opening therethrough and an elongated stem including an externally threaded segment configured to extend through the opening in said main body and into the opening in said hand gripping portion such that the threaded segments of the two cooperate with one another for connecting the stem to the hand gripping portion, said stem also including shoulder means engaging said main body for connecting the latter with said hand gripping portion, whereby said blade connecting head portion in its entirety is disengagably connectable with and disengagable from said hand gripping portion;
   (c) means carried partially by said handle and partially by said blade including a power supply within said inner chamber for producing a beam of light in a predetermined direction relative to the tongue holding segment of said blade when said blade is connected with said handle in a specific way; and
   (d) first and second cooperating means respectively forming parts of the head portion of said handle and the handle connecting segment of said blade for disengagably connecting said blade to said handle in said specific way so as to cause said beam to be produced.

39. A laryngoscope according to Claim 38 wherein said beam producing means includes an elongated electrically conductive member which is disposed within said sleeve and which has a bottom end in electrical engagement with said power supply.
and a top end accessible from the top end of said sleeve.

40. A laryngoscope according to Claim 39 wherein the shoulder means forming part of said sleeve includes a shoulder larger than the opening in the main body of said blade connecting head portion and located at the top end of the stem, said shoulder including an opening through which a portion of said electrically conductive member extends and a slotted top surface for receiving a screwdriver.

41. A laryngoscope according to Claim 38 wherein said hand gripping portion of said handle has means including a number of disengagable components for receiving a laryngoscope blade different in design than said first-mentioned blade without utilizing said blade connecting head portion, one of said components serving to aid in connecting said blade connecting head portion with said hand gripping portion when the former is used.

42. A laryngoscope, comprising:
   (a) a handle including an elongated hand gripping portion and a blade connecting head portion;
   (b) a light source carried by said handle;
   (c) means for energizing said light source;
   (d) a blade separate from said handle and including
      (i) a handle connecting segment,
      (ii) an elongated, curved tongue holding segment connected with and extending out from said handle connecting segment,
      (iii) an elongated light guide, at least a section of which corresponds generally in curvature to a section of said curved tongue holding segment, and
   (iv) means for fixedly connecting said light guide to said handle connecting and tongue holding segments such that its curved section extends along and adjacent the corresponding curved section of said tongue holding segment, without using a curved hole through either of said blade segments; and
(e) first and second cooperating means respectively
forming parts of the head portion of said handle and the
handle connecting segment of said blade for disengagably
connecting said blade to said handle in a specific way which
places an adjacent end of said light guide in optical com-
munication with said light source, whereby light received at
said end is directed by the light guide to its opposite end.

43. A laryngoscope according to Claim 42 wherein said light
guide includes a straight end section and wherein said light
guide connecting means includes a straight opening through a
part of the tongue holding segment of said blade for re-
ceiving and holding said straight end section.

44. A laryngoscope according to Claim 43 wherein said light
guide connecting means includes a hole through a part of the
handle connecting segment of said blade for receiving and
holding an opposite end section of said light guide and a
slot extending into said last-mentioned opening from one
side thereof for aiding in placing said opposite end section
of said light guide into said last-mentioned opening.

45. A laryngoscope according to Claim 44 wherein said slot
extends the length of said last-mentioned opening and is
slightly narrower than the maximum cross sectional conﬁg-
uration of said last-mentioned opening and the light guide,
whereby said opposite end section of said light guide can be
placed into said last-mentioned opening by forcing it
through said slot.

46. A laryngoscope according to Claim 44 wherein said slot
is deﬁned by a ramped surface in the handle connecting
segment of said blade.

47. A laryngoscope according to Claim 42 wherein said light
guide connecting means includes a pair of open-ended straight
openings in said blade segments.
48. A laryngoscope according to Claim 47 wherein at least one of said openings has a side wall around its entire circumference.

49. A laryngoscope according to Claim 42 wherein said light guide is flexible and wherein said light guide connecting means serves to maintain said curved section in said corresponding curvature.

50. A laryngoscope blade for use with a laryngoscope handle including a light source and means for energizing said light source, said blade comprising:
   (a) a handle connecting segment;
   (b) an elongated, curved tongue holding segment connected with and extending out from said handle connecting segment;
   (c) an elongated light guide, at least a section of which corresponds generally in curvature to a section of said curved tongue holding segment; and
   (d) means for fixedly connecting said light guide to said handle connecting and tongue holding segments such that its curved section extends along and adjacent the correspondingly curved section of said tongue holding segment, without using a curved opening through either of said blade segments.

51. A laryngoscope blade according to Claim 50 wherein said light guide is flexible and wherein said light guide connecting means includes means forming part of each of said blade segments for maintaining said curved section of said light guide in said corresponding curvature.

52. A laryngoscope blade according to Claim 51 wherein each of said means forming part of each blade segment includes an open-ended straight opening through a part of that segment.

53. A laryngoscope blade for use with a laryngoscope handle having a light source and means for energizing said light
source, said blade comprising:

(a) a handle connecting end segment including a straight, open-ended opening extending through a portion thereof and a slot extending into said opening from one side thereof;

(b) an elongated, curved tongue holding segment integrally formed with and extending out from said handle connecting segment, said tongue holding segment including an open-ended, straight opening extending through a part thereof, said opening being entirely closed circumferentially and being oriented in a predetermined way relative to said opening in said tongue holding segment; and

(c) a flexible, elongated light guide having one end section disposed within the opening in said tongue holding segment and an opposite end segment disposed within the opening in said handle connecting segment, said openings being oriented relative to one another so as to maintain an intermediate section of said light guide in a curved configuration corresponding to and extending along side a section of said curved tongue holding segment.

54. A laryngoscope blade according to Claim 53 wherein said slot extends the entire length of its adjacent opening and serves to place the associated end segment of said light guide therein.

55. A laryngoscope blade according to Claim 53 wherein said slot is defined by a ramped surface in said handle connecting segment so as to aid in placing the associated end segment of said light guide into its adjacent opening.

56. A method of making a laryngoscope blade of the type designed to cooperate with a laryngoscope handle having a light source and means for energizing said light source, said method comprising the steps of:

(a) molding a laryngoscope blade body as a single unit having

(i) a handle connecting segment,
(ii) an elongated, curved tongue holding segment connected with and extending out from said handle connecting segment, and

(iii) an open-ended straight opening in each of said segments, said openings being oriented relative to one another in a predetermined way;

(b) providing an elongated, flexible light guide; and

(c) placing opposite end segments of said light guide into said openings through said handle connecting segment and tongue holding segment, respectively, said openings being oriented relative to one another such that placement of said end segments in said openings automatically causes an intermediate section of said light guide to be maintained in a curved configuration corresponding to and extending along side a section of said curved tongue holding segment.

57. A method according to Claim 56 wherein the opening in said tongue holding segment is entirely closed circumferentially between its opposite ends and wherein said handle connecting segment is formed with a slot extending into said opening in said handle connecting segment, and wherein said opposite end segments of said light guide are placed into their respective openings by first placing one of said end segments into the opening in said tongue holding segment and thereafter forcing the opposite end segment into the opening in said handle connecting segment using said slot as a guide.

58. A method according to Claim 57 wherein said slot is formed to extend the entire length of its associated opening whereby the end segment of said light guide to be placed within said last-mentioned opening is moved sideways relative to said opening through said slot for placement within the opening.

59. A method according to Claim 57 wherein said slot is formed to include a ramped surface and wherein the end
segment of said light guide to be placed in the opening adjacent the slot is moved therein along said slot and against said ramped surface.
# INTERNATIONAL SEARCH REPORT

**International Application No** PCT/US82/01419

## I. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both National Classification and IPC:

- **INT. CL.** 3 A61B 1/26
- **U.S. CL.** 128/11, 16

## II. FIELDS SEARCHED

**Minimum Documentation Searched**

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<td>128/6,7,8,9,10,11,13,16,18,22,339/80,95R</td>
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**Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched**

## III. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of Document, 16 with Indication, where appropriate, of the relevant passages 17</th>
<th>Relevant to Claim No. 18</th>
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<tbody>
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<td>U.S., A, 3,826,248 Published 30 July 1974, Gobels</td>
<td>1-2, 7-12, 14-21, 26-29, 31-34, 38-40, 42-43, 47, 50, 53, and 56</td>
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* 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 document 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

**"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.

**"A"** document member of the same patent family

## IV. CERTIFICATION

**Date of the Actual Completion of the International Search** 13 December 1982

**Date of Mailing of this International Search Report** 19 JAN 1983

**International Searching Authority** ISA/US

**Signature of Authorized Officer**

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Form PCT/ISA/210 (second sheet) (October 1981)
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of Document, 18 with indication, where appropriate, of the relevant passages 17</th>
<th>Relevant to Claim No 18</th>
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<td>A</td>
<td>U S, A, 3,426,749 Published 11 February 1969 Jephcott</td>
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<td>Y</td>
<td>U S, A, 3,916,881 Published 04 November 1975 Heine</td>
<td>1-2, 7, 14-21, 24-29, 32-34, 38-39, 41-42, 50, 53, and 56</td>
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<td>Y</td>
<td>U S, A, 2,289,226 Published 07 July 1942 Von Forreger</td>
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<tr>
<td>Y</td>
<td>U S, A, 4,273,112 Published 16 June 1981 Heine et al.</td>
<td>1, 7-12, 14-21, 24-30, 32-34, 38-39, 41-43, 50, 53, and 56</td>
</tr>
<tr>
<td>Y</td>
<td>U S, A, 3,949,740 Published 06 April 1976 Twentier</td>
<td>1, 7-12, 14-21, and 24-26.</td>
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