LABORATORY REPORT

Title:

A NEW DEVICE FOR AUSCULTATION OF AIR FLOW TO MAKE ENDOTRACHEAL INTUBATION EASY

Authors:

Francisco Hernández Altemir, Sofía Hernández Montero, Manuel Moros Peña.

Department of Oral and Maxillofacial Surgery (Head: F. Hernandez Altemir). "Miguel Servet" University Hospital. Zaragoza. Spain.

First author´s adress:

Francisco Hernández Altemir, M.D.

Head of the Maxillofacial and Oral Surgery Service

C/Fray Luis Amigó, nº 8, letra B, planta 0.

50006. Zaragoza (Spain)

Telephone: 976 27 07 19

FAX: 976 38 75 53

Email: ib307518@public.ibercaja.es

998 words.

Submitted September 2002.

Introduction.

This invention is referred to a new device specially conceived for the auscultation of air flow close to supraglotic space of a patient, in order to make endotracheal intubation easy, particularly to make the access of the flexible fiberoptic bronchoscope into the trachea easy, that will guide the intubation preferably nasotracheal with the endotracheal tube.

Exactly, the aim of this invention is to make the manipulation of the fiberoptic bronchoscope in the supragflotic space easy, at the moment that the distal or operative extremity, flexible and with controlled movement, reachs the supraglotic space, in order to avoid its penetration into oesophagus and to direct the active portion of the fiberoptic bronchoscope towards the tracheal space, making use of the auscultation of air flow when the patient is with spontaneous breathing.

Actually, auscultation of airways is achieved in the optical or visual way using usually a fiberoptic bronchoscope, that it's useful too to make easy a subsequent endotracheal intubation, usually through nasal via, acting as a guide for the endotracheal tube.

A fiberoptic broncoscope essentially consists in a flexible arm, of an appropiate length, with at least three conduits inside of it, one for visualization, other for illumination and the last for oxygen introduction, suction or washing. Conduit one and two are filled with beams of optic fibre. This flexible arm ends proximally in a bolster that contains the different access to the conduits before named. Distally, the arm ends in an insertion tip, that we can direct with a lateral movement from the bolster by means of a small leveler lever.

A peephole is axially stablished in trhe bolster and allows to see how the fibroscope advances trough nasal way and oropharynx, anyway an adequate position of the active distal portion to orientate it at the moment to the supraglotic air flow and to avoid its erroneous introduction into the oesophagus or other structures.

However, sometimes and because of different difficulties, such as failures of the illumination system, excess of secretions...the visual exploration can be very difficult, and even impossible, so the access to trachea passes to be an azar function.

Our device can satisfactorily help to solve this trouble, because it´s based in the detection of the sound that the air produces in the supraglotic space, of course if the patient is with spontaneous breathing. Obviously, this sound isn´t so manifest at the proximal portion of oesophagus, and this allows to orientate the bronchoscope insertion tip.

Material and Methods.

Specifically, the simplest variety of this device is made of a conventional stethoscope, with an elasticly deformable metalic arc ended in a couple of headphones to fit together to external auditive conduit, arch associated with a box with the classical spring system that allows the opening of the metalic arch and the sound amplification elements such as an amplifier bell or even a microphone connected trough an amplifier to some loudspeakers. From this box a flexible tube of an appropiate length emerges, ending in a connector with the appropiate characteristics to be coupled to the bronchoscope, by preasure, to the entrance for aspiration, oxygenation or washing, or to the entrance to bring anaesthetic gases, in the way that the selected conduit operates as sound transmission medium from the distal portion of the bronchoscope.

To complete this description, we will use the following figures. **Figure 1-A** shows a conventional fiberoptic bronchoscope **(1)** with its flexible arm **(2)**, the insertion tip **(3)** manoeuvrable from the bolster **(4)** with help of a leveler lever **(5)** and visually controlled through a peephole **(6)** axially coupled to the bolster, and a connector **(10)**.

Figure 1-B shows a system that reminds a conventional stethoscope **(11)**, with headphones **(12)**, an elasticly deformable metalic arc **(13)** ended in a box with the classical spring system that allows the opening of the metalic arch and the sound amplification elements **(14)**. From this box a flexible tube **(15)** of an appropiate length emerges, ending in a connector with the appropiate characteristics to be coupled to the connector of the fiberoptic bronchoscope **(10)**.

Figure 1-C shows a conventional endotracheal tube.

Figure 2 shows a detail of a cross-section of the flexible arm trough cut line A-B of figure 1-A, with optic fibre to see the advance **(7)**, optic fibre beams to light the area

where the insertion tip is approaching **(8, 8′)**, and empty conduit to bring oxygen, suction, washing or any other endotracheal manipulation to achieve **(9)**.

Figure 3 shows the completly assembled and introduced in a patient device, searching for the supraglotic space. The auscultation of air flow will allow to orientate the fiberoptic bronchoscope insertion tip **(3)** towards trachea **(18)** and not into oesophagus **(19)**.

Figure 4 shows a variant of the device that consists in relationing the amplifier established in the box of the device with a microphone **(20)** situated at the insertion tip or next to it by means of a properly isolated rigid enough conductor filament **(21)**, where it arrives trough the oxygenation, suction or washing conduit. So, the loans of the device improve because the sound receptor (the microphone) approachs the air flow emission source, at the expense of a bigger complexity of the manipulation because the electric conductor filament must be introduced and extracted from the aforementioned conduit if we need it for the clasical function that it has been designed for.

Finally, and according to a third variety, **figure 5** shows the device as an autonomous and self-sufficient element, in stead of being coupled to a fiberoptic bronchoscope. It includes a bolster **(4′)** with a flexible arm **(2′)** with the classical insertion tip **(3′)** manoeuvrable from the bolster lever **(5′)**, but this flexible arm has just one conduit for sound transmission or for passage of the electric conductor filament when the microphone is situated at the insertion tip. Its purpose is just to establish acoustic communication between the insertion tip and the connector that ends axially the bolster **(22)** and that form the union nexus with the stethoscope **(11)**.

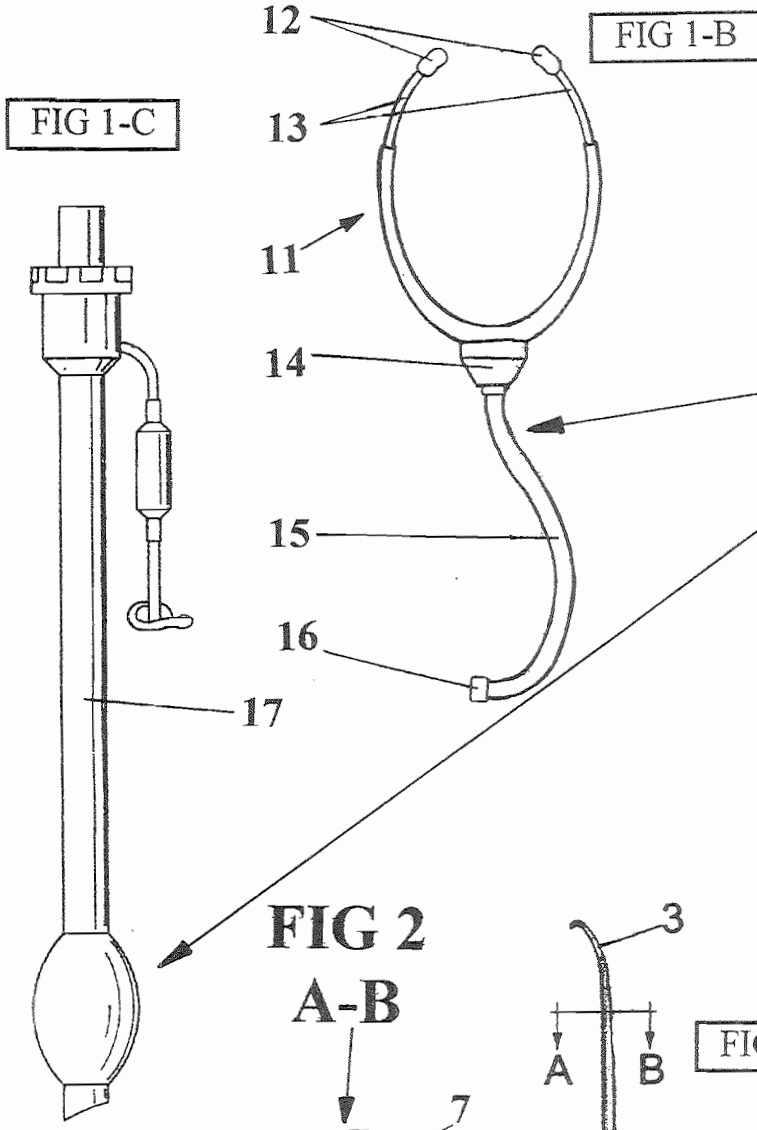


FIG 1-B

FIG 1

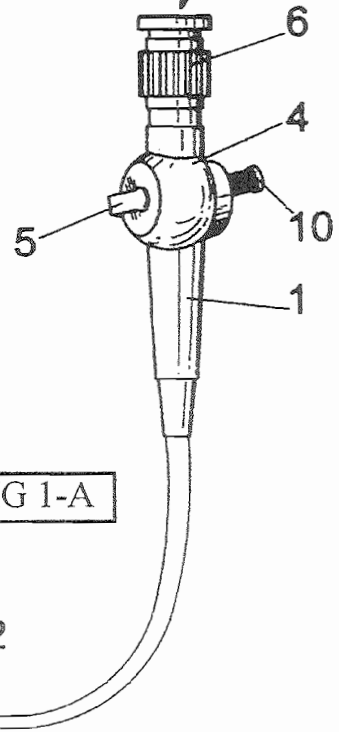
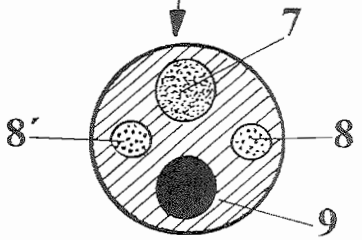


FIG 1-A

FIG 2
A-B



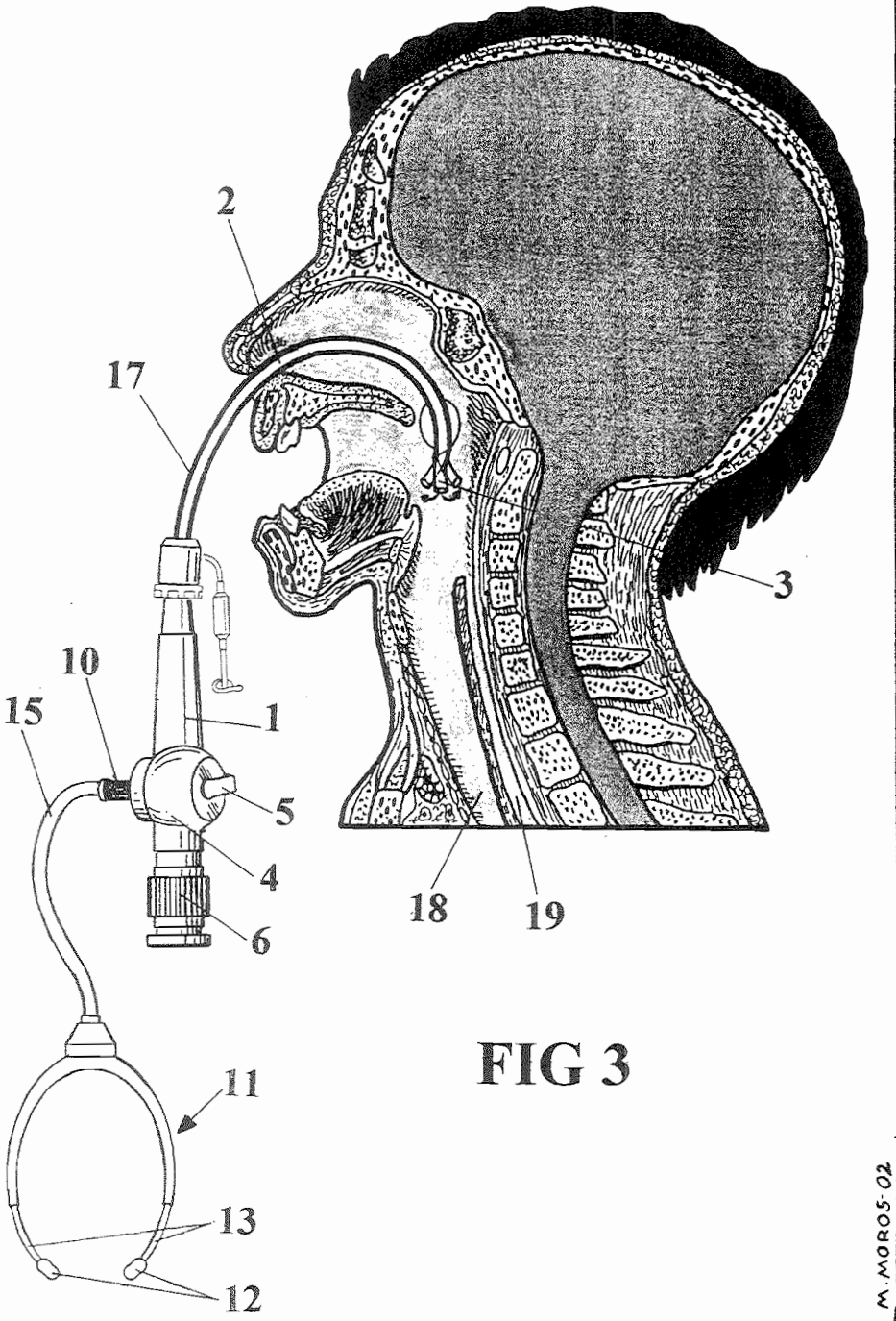


FIG 3

M. MOROS-02

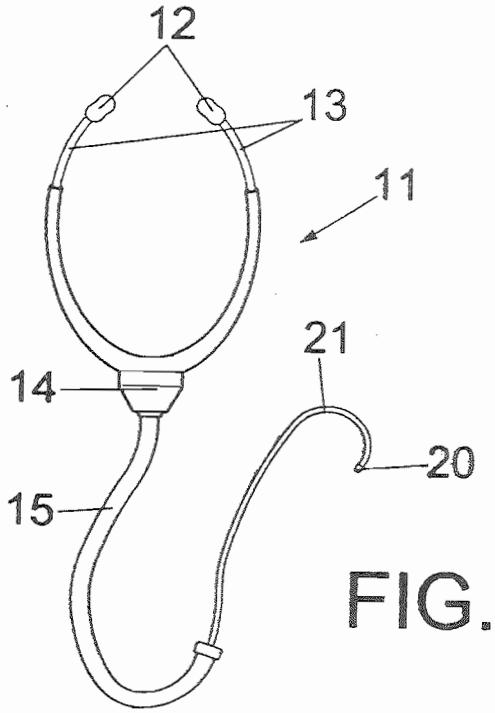


FIG. 4

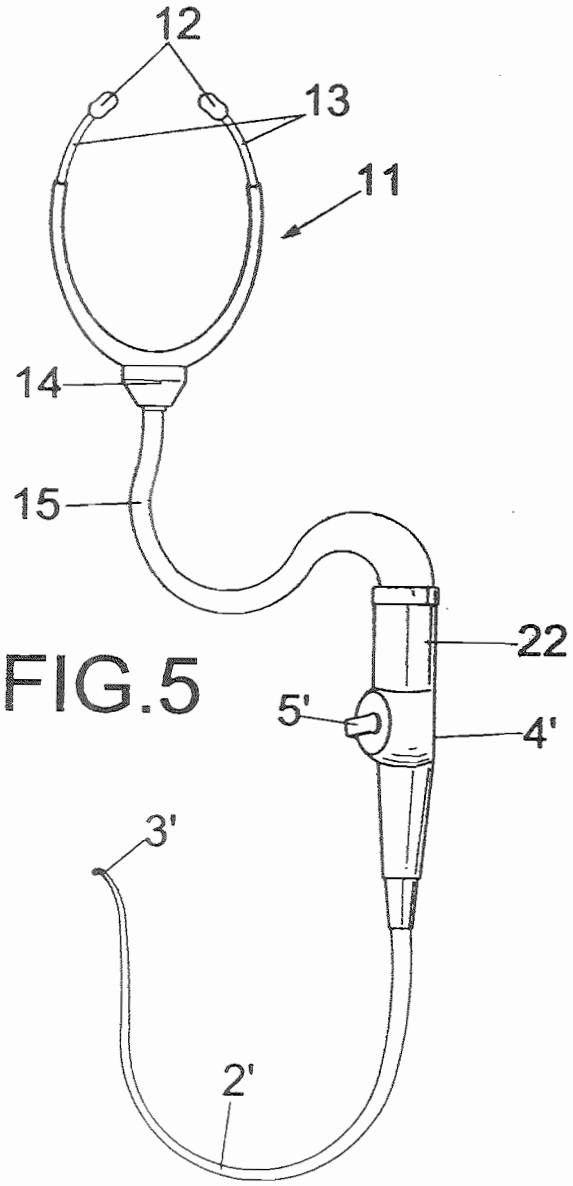


FIG.5

M.MOROS-02