

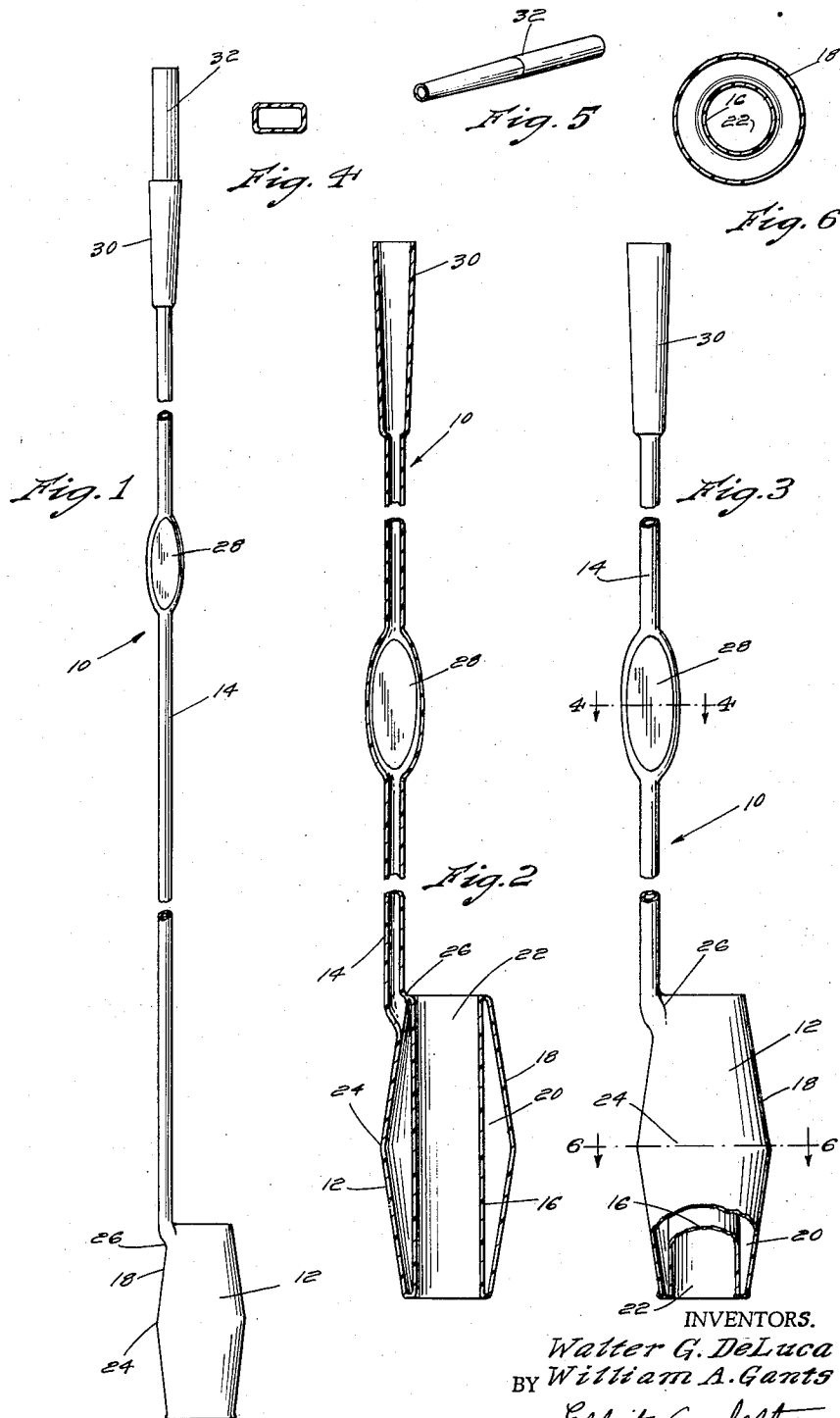
April 28, 1959

W. G. DE LUCA ET AL

2,883,986

ENDOTRACHEAL CUFF

Filed Sept. 24, 1957



INVENTORS.
Walter G. DeLuca
BY William A. Gents
Elliot A. Salter
Attorney.

1

2,883,986

ENDOTRACHEAL CUFF

Walter G. De Luca, Cranston, and William A. Gants, Barrington, R.I., assignors to Davol Rubber Company, Providence, R.I., a corporation of Rhode Island

Application September 24, 1957, Serial No. 685,877

3 Claims. (Cl. 128—351)

The present invention relates generally to medical and surgical equipment and is more particularly concerned with the provision of means for maintaining normal breathing of the patient during surgical operations and the like.

A primary object of the instant invention is the provision of a novel and improved endotracheal cuff which will insure that an effective seal is present between the external surface of an endotracheal tube and the internal surface of the trachea.

Another important object of our invention is the provision of an endotracheal cuff which will expand with a high degree of uniformity whereby to insure that a constant pressure will be exerted on the trachea thus, in turn, insuring the presence of an effective seal.

Another object of this invention is the provision of a novel and improved endotracheal cuff which may be readily and simply inflated and without the necessity of utilizing an inflating needle or the like.

A further object of our invention is the provision of an endotracheal cuff wherein the cuff and its inflating tube comprise an integral, one-piece unitary construction.

Still another object of this invention is the provision of an endotracheal cuff which is economically feasible to manufacture and which is highly efficient in use.

Other objects, features and advantages of the invention will become apparent as the description thereof proceeds when considered in connection with the accompanying illustrative drawings.

In the drawings which illustrate the best mode presently contemplated by us for carrying out our invention:

Fig. 1 is a side elevational view of an endotracheal cuff constructed in accordance with the instant invention;

Fig. 2 is a sectional elevation thereof, on an enlarged scale;

Fig. 3 is a side elevation thereof, on an enlarged scale, with a portion broken away for purposes of illustration;

Fig. 4 is a section taken on line 4—4 of Fig. 3;

Fig. 5 is a perspective detail of the adapter insert which forms a part of our invention; and

Fig. 6 is a section taken on line 6—6 of Fig. 3.

Maintenance of the patency of the respiratory tract, and of normal volume of breathing are most important to the patient during the performance of surgical operations performed with anesthesia. Control of pulmonary ventilation is predicated upon the following factors—(1) normal supply and uptake of oxygen; (2) normal disposal of carbon dioxide; and (3) normal degree of expansion and contraction of the lungs. Among the instruments that may be used to insure the above mentioned requirements are nasopharyngeal tubes, oropharyngeal tubes, and endotracheal tubes, it being understood that the circumstances under which these instruments are used will necessarily depend on the judgment of the anesthesiologist, who will recognize symptoms of airway obstruction as they present themselves and institute the proper treatment. The instant invention, however, is concerned with

2

endotracheal tubes, and, more particularly, with endotracheal cuffs used in combination with said tubes for effecting a seal between the external surface of the tube and the internal surface of the trachea.

Generally speaking, the conventional endotracheal cuff comprises an inflatable balloon or sac surrounding the distal end of the endotracheal tube whereupon, after the tube has been inserted, the cuff may be inflated to provide the desired seal between the external surface of the tube and the internal surface of the trachea. Quite obviously, if this seal were not effectively provided, undesirable foreign particles or gases could still find their way into the patient's trachea exteriorly of the inserted endotracheal tube, whereby the effectiveness and control afforded by the tube would be greatly lessened.

It has been found that one of the main reasons why endotracheal cuffs heretofore in use have not always provided an effective seal is due to the fact that the cuff balloon or sac does not uniformly distend. Therefore, there has been provided in accordance with the instant invention, now to be described, an endotracheal cuff which will uniformly distend even at minimum pressures whereby to insure the presence of an effective seal. In addition, as will be apparent from the description now to be given, our cuff may be more easily inflated and does not require the use of inflating needles or the like which must be laboriously threaded into the proximal end of the inflating tube.

Referring now to the drawings, there is shown generally at 10 an endotracheal cuff constructed in accordance with the instant invention. Basically, the cuff 10 comprises an inflatable balloon or sac portion 12 and an inflating tube 14 connected therewith.

As will be seen most clearly in Fig. 2, the balloon or sac portion 12 comprises circular inner and outer walls 16 and 18, respectively, which walls define a substantially circular inflating area 20. Also, as will be noted, the wall 16 defines a bore 22, which bore is adapted to snugly receive the distal end of a conventional plastic or rubber endotracheal tube (not shown).

An important feature of the instant construction resides in the fact that outer wall 18 of balloon 12 gradually tapers outwardly from its opposite extremities whereby to provide an outwardly disposed bulge or crease 24, substantially centrally positioned with respect to the balloon or sac 12. It has been found that this particular construction causes the balloon to distend with a high degree of uniformity even at minimum pressures since the inflating air is at all times able to circulate within the area 20 to insure an even distribution of said air.

As a result of a highly unique and ingenious method of manufacture utilized in connection with the instant product, which method is completely disclosed and described in copending application Serial No. 685,876, filed September 24, 1957, the device 10 is an integral, one-piece construction throughout. Thus, as will be most clearly seen in Figs. 1, 2 and 3, and particularly Fig. 2, the inflating tube 14 is in communication with the inflating area 20 of the balloon 12, and said inflating tube integrally joins with the inner and outer walls of said balloon as at 26. Intermediate its length, the tube 14 is provided with an inflatable portion 28, the purpose of which will hereinafter be made apparent; and at its upper extremity, the tube 14 is provided with a funnel-like terminal portion 30. It will be understood that the entire cuff 10 is constructed of a resilient, yielding material such as rubber, latex or the like.

In operation and use, the funnel-like portion 30 of cuff 10 snugly receives a polyvinyl tube 32, which tube functions as an adapter for receiving an inflating syringe or the like (not shown). The use of the adapter 32 is

3

highly important since it completely eliminates the necessity of laboriously inserting an inflating needle into the proximal end of the tube 14, such as has heretofore been the common practice. Once the adapter 32 has been inserted as shown in Fig. 1, the cuff 10, and more particularly the balloon or sac portion 12 is snugly placed on the distal end of an endotracheal tube (not shown), after which the tube and cuff are inserted through the nose or mouth of the patient, then through the glottis into the trachea. The inflating syringe (not shown) is then inserted into the adapter 32, and the balloon 12 is inflated, just to the degree sufficient to constitute a proper seal. This is determined by the anesthesiologist manually squeezing the rebreathing bag, at which time if gases escape the cuff is insufficiently inflated. Once the cuff is properly inflated, the portion 28 will also inflate and will function as a tell-tale in order that the anesthesiologist may at all times know whether the balloon 12 is properly inflated.

As will be apparent, when the balloon 12 is properly inflated, it will not only distend to form a seal against the interior surface of the trachea, but the wall 16 will also tightly grip against the external surface of the endotracheal tube whereby to insure that an effective seal is provided therebetween and also insuring that no relative longitudinal movement can take place between the cuff 10 and the endotracheal tube per se.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except in so far as indicated by the scope of the appended claims.

We claim:

1. An endotracheal cuff comprising an inflatable sac

4

portion having a cylindrical inner wall and an outer wall circumferentially superimposed thereover, said inner and outer walls being connected at their opposite extremities to provide an intermediate inflating area, said outer wall tapering outwardly from its opposite extremities whereby to provide an outwardly disposed circumferential bulge, and an inflating tube connected to said sac portion and in communication with said inflating area.

2. An endotracheal cuff comprising an inflatable sac portion having a cylindrical inner wall and an outer wall circumferentially superimposed thereover, said inner and outer walls being integrally connected at their opposite extremities to provide an intermediate inflating area, and a flexible, resilient inflating tube integrally connected at one of its ends to said sac portion and in communication with said inflating area, said inflating tube having a relatively rigid adapter tube connected to its other end.

3. An endotracheal cuff comprising an inflatable sac portion having a cylindrical inner wall and an outer wall circumferentially superimposed thereover, said inner and outer walls being integrally connected at their opposite extremities to provide an intermediate inflating area, said outer wall tapering outwardly from its opposite extremities whereby to provide an outwardly disposed circumferential bulge, and a flexible, resilient inflating tube integrally connected at one of its ends to said sac portion and in communication with said inflating area, said inflating tube having a relatively rigid adapter tube connected to its other end.

References Cited in the file of this patent

UNITED STATES PATENTS

2,175,726	Gebauer	Oct. 10, 1939
2,792,837	Kardos	May 21, 1957

FOREIGN PATENTS

151,721	Australia	Oct. 18, 1951
---------	-----------	---------------