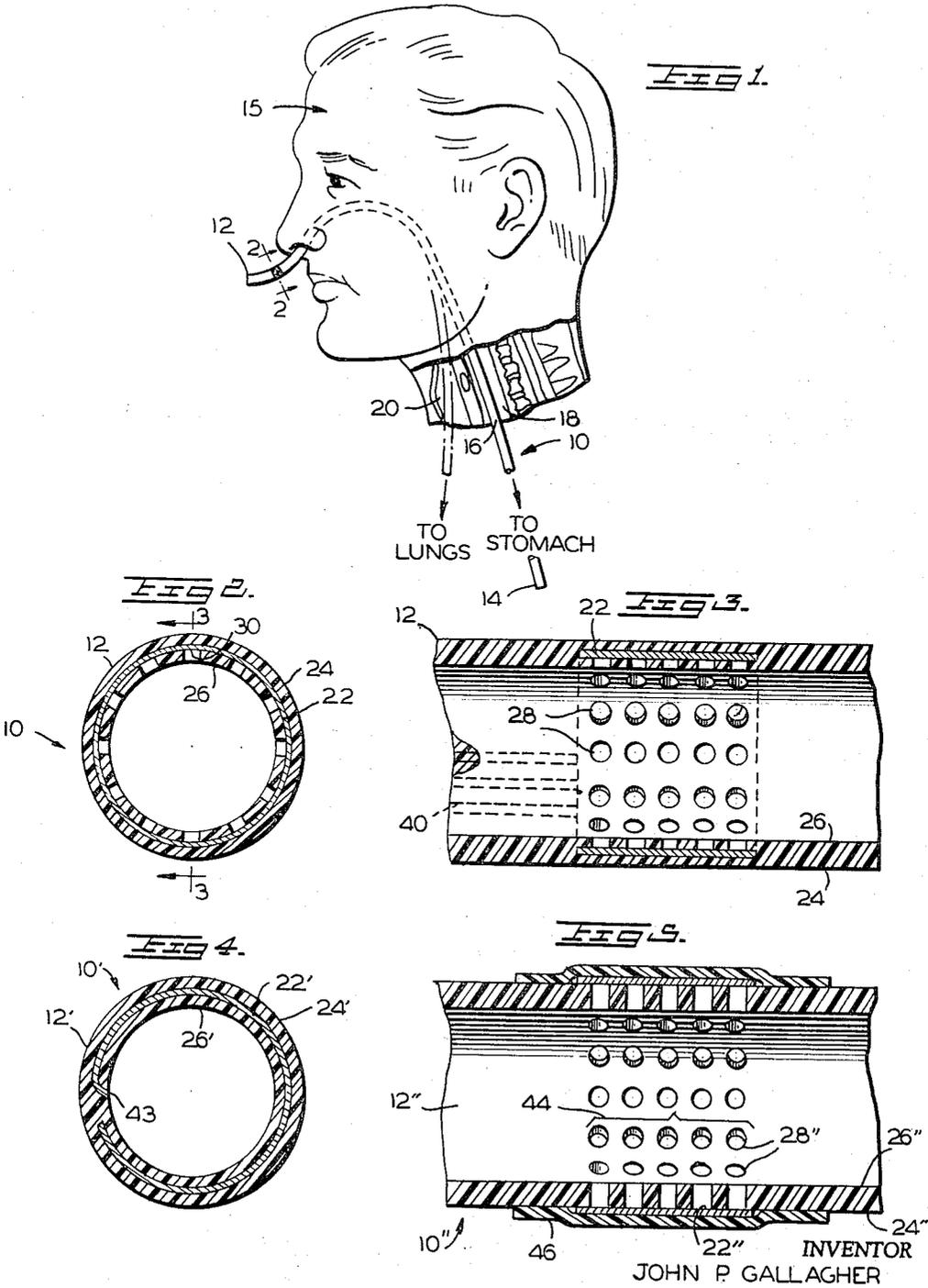


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MEDICAL-SURGICAL TUBE

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**MEDICAL-SURGICAL TUBE**

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This invention relates to an improved medical-surgical tube and in particular to such a tube having a color-change acid-base indicator means associated therewith.

In many surgical or clinical procedures, in which tubes or catheters are employed, it is essential to be able to determine the location of the outlet or distal end of the tube within the body of the patient. One important and common use of medical-surgical tubes is for feeding patients wherein a feeding tube is inserted through one of the nostrils into the stomach of the patient. After the tube is lodged in the stomach, the desired fluids may be forced through the tube directly into the patients stomach. However, it is not uncommon, in passing the distal end of the tube from the nasal cavity toward the stomach, that the distal end enters the trachea whereby the distal end lodges in a lung rather than the stomach of a patient. Forcing of fluids into such a mislocated tube could result in undesirable complications.

Medical-surgical tubes having X-ray opaque portions are known whereby directing a beam of X-rays through the body of a patient in the neighborhood of the inserted tube while observing the relative position of the tube a skilled technician or a physician could determine whether the feeding tube is correctly positioned in the stomach or incorrectly positioned in a lung of the patient. While the use of the X-ray technique for determining the position of medical-surgical tubes will provide the desired results such techniques require substantial skills and considerable time and equipment.

It is, therefore, a principal object of the present invention to provide a simple, relatively inexpensive, medical-surgical tube having incorporated therein a color-change acid-base indicator means whereby it may be simply, quickly and inexpensively determined if, for example, the distal end of a feeding tube is correctly positioned in a patient's stomach by merely determining the color of a color indicator which has been bathed in the body fluid surrounding the distal end of the tube.

These and other objects and advantages of the present invention are provided by a medical-surgical tube having an internal end portion adapted to be inserted within a body cavity and an external end portion adapted to remain outside of the body, a color-change indicator carrier means associated with the external end portion of the tube and means providing liquid communication between the inner wall of the tube and said indicator carrier means.

The invention will be more particularly described with specific reference to a stomach tube and in conjunction with the illustrative embodiments of the invention shown in the drawings wherein:

FIGURE 1 is a diagrammatic view of the upper portion of the human head illustrating one method of positioning a stomach tube through the nasal passage into the stomach of the patient;

FIGURE 2 is a section on line 2-2 of FIGURE 1;

FIGURE 3 is a transverse section on line 3-3 of FIGURE 2;

FIGURE 4 is a transverse section similar to that illustrated in FIGURE 2 of a further form of the present invention; and

FIGURE 5 is a longitudinal sectional view similar to that shown in FIGURE 3 of a further form of the improved medical-surgical tube of the invention.

Referring to the drawings and in particular to FIG-

URES 1, 2 and 3, **10** generally designates a stomach tube constructed in accordance with the present invention.

The tube **10** has a distal, or internal end portion **14** and an external end portion **12**. In FIGURE 1 the stomach tube **10** is shown passing through a nostril of a patient **15**, down through the esophagus **18**, thence to the stomach indicated by the reference arrow. Also in FIGURE 1, in broken lines, there is illustrated the tube **10** passing through the nasal passage of the patient **15** and into the larynx, through the trachea thence into the lungs in a manner not desired where the tube **10** is to be used to feed the patient **15**.

Now referring particularly to FIGURES 2 and 3, adjacent the external end portion **12** of the tube **10** an absorbent paper ring **22** is molded within the tube intermediate the outer wall **24** and the inner wall **26** with the axis of the ring of absorbent paper **22** being generally coaxial with the axis of the bore of the tube. A plurality of perforations **28** pass through the inner wall **26** of the tube **10** to the inner surface **30** of the absorbent paper ring **22** whereby liquid within the tube will bath the absorbent paper. In this form of the invention the absorbent paper **22** provides a carrier means for a color-change indicator. Preferably the color-change indicator is of the acid-base type and as used herein the color-change indicator is a substance which is used for the visual detection and determination of a specific constituent present in a liquid or mixture of liquids.

In general, indicators for the detection of acids and bases consist of substance that undergo visual change within a predetermined limited range of hydrogen ion concentration. Many such indicators are known in the art. Of the well-known indicators, litmus, a blue coloring matter from various species of lichens, particularly Variolaria, has been found to be a very satisfactory color-change acid-base indicator for the improved stomach tube. Litmus is partially soluble in water or alcohol and when used as an acid-base indicator it turns red at pH 4.5 and blue at pH 8.3. Litmus is non-toxic and in view of its non-toxicity has been used as a coloring agent for beverages.

Prior to sale of the improved medical-surgical tube, the carrier **22** for the color-change indicator is charged with for example a litmus solution which after drying remains within the carrier.

Other useful color-change acid-base indicators are set forth in the following table with their color characteristics:

TABLE I

Trade Name	Color	
	Acid	Basic
Methyl Orange.....	Red.....	Yellow.
Phenol Red.....	Yellow.....	Red.
Phenolphthalein.....	Colorless....	Pink.

In operation of the stomach tube hereinabove described with reference to the FIGURES 1 through 3, after the tube is inserted in the stomach of a patient a small amount of the fluid present in the body adjacent the distal end is drawn into the tube to pass through the openings **28** and thus wet the color-change indicator carrier **22**. If the distal end of the tube is properly within the stomach of the patient, and if the indicator is, for example, litmus the absorbent paper **22** will turn red as, on the average the pH of stomach juices is about 1 to about 2. If, however, the distal end of the tube has become improperly lodged in the lungs, the color indicator would indicate a blue color as the pH of the mucous and other fluids in the lungs averages about 7 with a range of from about 7.45 to about 8.15.

The juices bathing the lower end of the tube **10** may be drawn into the tube, to the zone of the color-change

indicator by suction means or as illustrated, in FIGURE 3, a plurality of capillary bores 40 may be provided in the tube, connecting the distal end and the absorbent paper 22. As a substitute for or in conjunction with the opening 28 and/or the capillary tubes 40, the tube 10 may be provided with a channel extending from the distal end to the carrier 22 which channel may be filled with a wicking substance such as absorbent paper and the like whereby body fluids at the distal end of the tube may be wicked into wetting relationship with the ring type carrier 22 for the color-change indicator.

Referring to FIGURE 4 of the drawing, a further form of the improved medical-surgical tube is illustrated. In FIGURE 4 the tube 10' having an inlet or external end portion 12' is provided with an internal carrier 22', such as absorbent paper, for a color-change indicator. In FIGURE 4 the carrier 22' is molded within the tube wall between the outer surface 24' and the inner surface 26' of the tube and one end 43 of the carrier 22' projects inwardly through the inner wall 26' to provide a wick whereby when body fluids are drawn upwardly from the distal end to the zone adjacent the color-change indicator carrier 22', the indicator carrier 22' is wetted by wicking action. This form of the invention may also be provided with capillary channels 40 as indicated in FIGURE 3 of the drawing.

Referring to FIGURE 5 of the drawing, a further form of the present invention is illustrated, wherein the medical-surgical tube 10'' having an external end portion 12'' is provided with a perforated zone 44 comprising a plurality of perforations 28'' which provide for communication between the inner wall 26'' and the outer wall 24'' of the tube 10''. An absorbent band or strip 22'' is mounted about the zone of perforations 44 in contact with the outer surface 24'' of the tube 10'' and is maintained in said stated relationship by a plastic, metal or the like sleeve 46 which may be heat sealed, cemented or frictionally maintained in its illustrated relationship on the outer surface of the tube 10''. This form of the invention may also be provided with capillary or wicking channels as discussed with reference to FIGURE 3 of the drawing. In the form of the invention illustrated in FIGURE 5, if the ring or band 46 is frictionally maintained in its illustrated relationship to the perforate zone 44 and the absorbent carrier 22'' for the color-change indicator, the absorbent band 22'' may be readily replaced after each use.

From the foregoing description, taken in consideration with the drawings, it will be seen that the present invention fully accomplishes the aims and objects hereinbefore set forth. While the invention has been particularly described with reference to the stomach tube, the invention has other uses for example, the urine of a healthy person has a known range of pH values and a doctor or technician can readily observe the pH condition of the urine during catheter draining thereof through the use of the present invention.

I claim:

1. A medical-surgical tube having an internal end portion adapted to be inserted within a body cavity and an external end portion adapted to remain outside the body, a color-change acid-base indicator carrier means on the tube and located adjacent the outlet end portion of the tube, and means providing liquid communication between the inner wall of the tube and said indicator carrier means.

2. The invention defined in claim 1 wherein said indicator carrier means comprises a piece of absorbent material and an indicator absorbed thereon.

3. The invention defined in claim 2 wherein the indicator absorbed on the absorbent material comprises litmus or phenolphthalein.

4. A medical-surgical tube having an internal end portion adapted to be inserted within a body and an external end portion adapted to remain outside the body, a color-change indicator carrier means on the tube and located adjacent the external end portion of the tube, an indicator absorbed on said carrier means, means providing liquid communication between the internal wall of the tube and the indicator absorbed on the indicator carrier means.

5. The invention defined in claim 4 wherein the indicator carrier means comprises an absorbent paper band formed within the tube and the means providing liquid communication between the internal wall of the tube and said indicator carrier means comprises a plurality of openings extending from the indicator carrier means through the inner wall of the tube in the zone of the indicator carrier means.

6. The invention defined in claim 1 wherein said indicator carrier means comprises a piece of absorbent paper one edge of which is maintained in fluid contact with a portion of the inner wall of said tube.

7. The invention defined in claim 1 wherein the indicator carrier means comprises a band of absorbent material extending about a portion of the outer surface of the tube, a protective band extends over said absorbent carrier, and a zone of perforations extends between the inner surface of said absorbent carrier and the interior of said tube.

#### References Cited

##### UNITED STATES PATENTS

2,567,445	9/1951	Parker	116—114 X
2,918,893	12/1959	Norton	116—114
3,058,472	10/1962	Thornton	128—348
3,155,091	11/1964	Nissenbaum	128—2

##### FOREIGN PATENTS

519,368	2/1931	Germany.
241,199	1/1926	Great Britain.

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