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GASTRO-INTESTINAL TREATMENT SYSTEM

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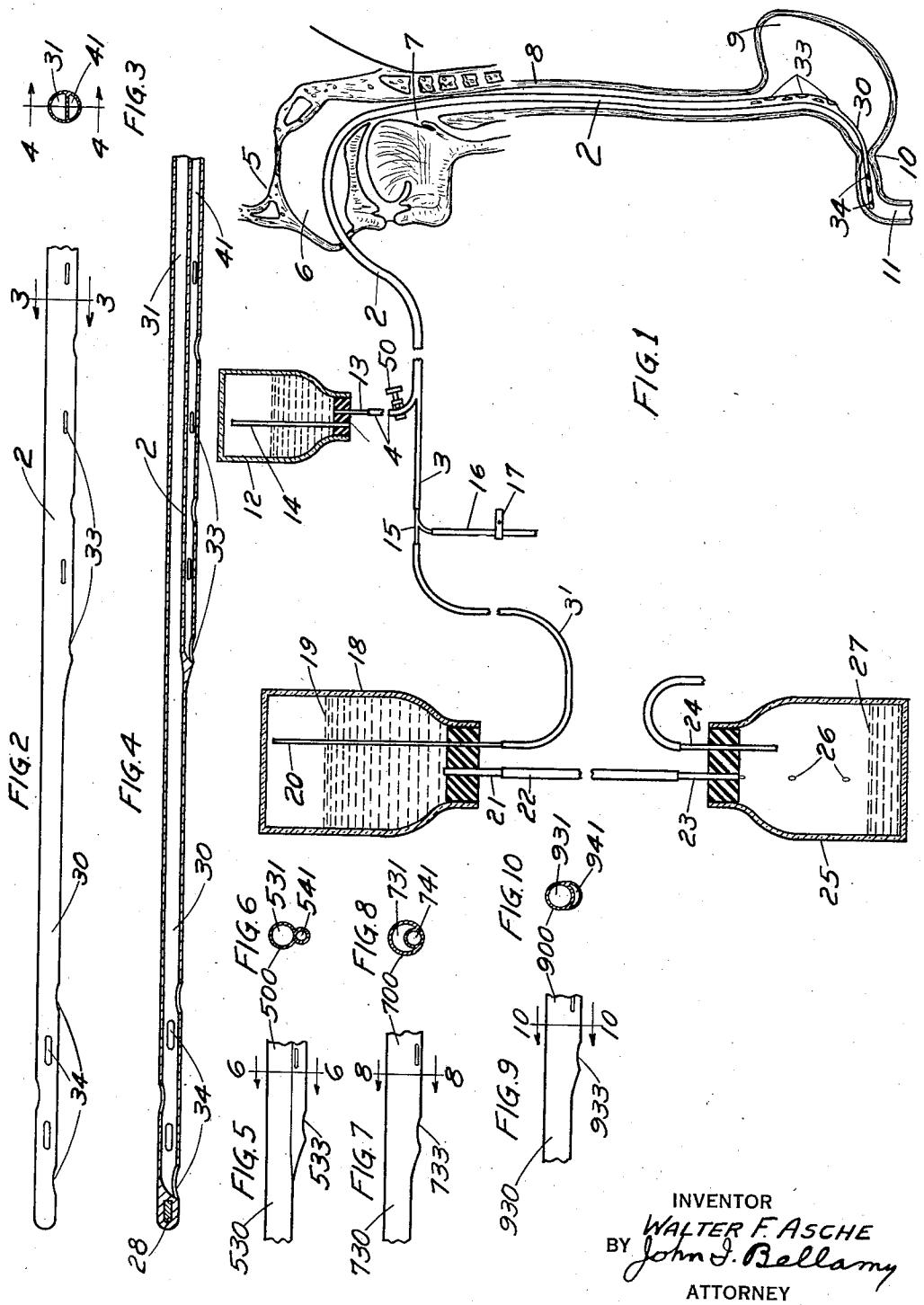

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GASTRO-INTESTINAL TREATMENT SYSTEM

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2 Claims. (Cl. 128—276)

My invention relates generally to gastro-intestinal treatment systems, and has for its object the production of a new and improved system for treating acute gastro-intestinal disturbances, together with the production of such novel arrangements of apparatus as are necessarily comprised in the system.

More specifically, my invention has for its object the provision of a system of apparatus which will permit the duodenum to be continuously vented, and gently collapsed by suction, while contemporaneously permitting the stomach to be continuously vented, as well as supplied with a regulated flow of suitable liquid food sufficing to nourish the patient and to maintain normal peristaltic movement from stomach to duodenum and the following intestinal portions.

My invention contemplates a duplex treatment tube for insertion into the gastro-intestinal tract through a nasal passage and the esophagus, with separated passageways, one communicating with the stomach, the other with the duodenum.

General Description

It is well known to those familiar with the alimentary canal, together with its operation and pathological conditions, that surgical shock, peritonitis, and other causes sometimes prevent or inhibit normal peristaltic action, causing a severe distended condition of the small intestine and stomach, often resulting in the complete isolation of an intermediate section of the tortuously winding small intestine. When a portion of the intestine is isolated, such portion, the stomach, and the intervening intestinal portion become painfully and dangerously distended, and the resulting stagnant and toxic condition so affects the entire system as to cause death in a short time unless relief is given.

In the treatment of this condition, two things are necessary: (1) temporary relief must be given by the removal of the distending gases and the poisoning liquid from the stomach and the upper part of the small intestine; and (2) while appropriate corrective measures are being taken to restore normal peristaltic movement, the patient must be supplied with water and nourishment, and the further accumulation of gas and toxic liquid must be prevented.

Heretofore, the upper part of the small intestine (the duodenum) has been vented by a tube reaching it by way of a nasal passage, the esophagus, and the stomach. This tube initially permits deflation of the stomach as the vent tube is being passed through it, but the stomach becomes redistended while the duodenum tube is in place, necessitating a partial removal of the tube to permit escape of stomach gas. This procedure, besides being exceedingly wearing on the patient, is very unsatisfactory because of the difficulty arising when it is attempted to pass the tube again from the stomach to the duodenum, keeping in mind the general distended intestinal condition. As a result, the stomach is often allowed, of necessity, to remain more or less distended for long periods, pressing on the nerve centers of the solar plexus. This pressure, as is well known, has an adverse effect on the resumption of the necessary peristaltic action. Furthermore, the stomach itself, if vented and supplied with small amounts of suitable liquid would assist greatly in promoting the necessary sympathetic nerve action regulating general peristalsis. This latter, however, has not heretofore been possible, and the nourishment necessary to maintain the strength of the patient has been perforce supplied intravenously, sub-cutaneously, or by the rectal route.

My improved treatment system, by using a duplex tube having separated passageways for the stomach and duodenum, permits separate simultaneous treatment of both organs, each to be treated as its condition demands and without interference with the treatment being given to the other.

The foregoing and other objects and features of the invention will be made more manifest as this description progresses.

The drawing

Referring now to the accompanying drawing, comprising Figs. 1 to 10, they show sufficient views of the apparatus involved in a treatment system to enable the invention to be understood.

Figure 1 shows, more or less diagrammatically and on reduced scale, the essential parts of the system as they are preferably assembled in treating a patient;

Figures 2 to 4 are full-scale drawings showing the stomach-duodenum end of the preferred form of the duplex treatment tube, normal adult size; and

Figures 5 to 10 show two views of each of three desirable modifications of the duplex treatment tube.

Detailed Description

The invention having been described generally, a detailed description of the apparatus shown will now be given.

The duplex tube

The duplex tube **2**, Figs. 1 to 4, is preferably molded rubber of a sufficient over-all length (about four feet) to enable it to be located and used as clearly indicated in Fig. 1.

Figure 2 shows a full scale outside view of the internal end of an adult size duplex tube, while Fig. 3 shows a section taken at the line **3—3** of Fig. 2, showing the separation of the internal portion of the tube into duodenum and stomach passageways **31** and **41**.

Figure 4, taken on the center-line **4—4** of Fig. 3, shows that the stomach passageway **41** ends some distance from the end of the tube, only passageway **31** continuing in the duodenum extension **30** of the tube.

Figures 2 and 4 clearly show the perforations **33** through which passageway **41** communicates with the stomach, as well as the perforations **34** through which passageway **31** communicates with the duodenum.

In Fig. 1, the head of the patient is denoted by the numeral **5**, with **6** and **7** denoting a nasal passage and the throat respectively. The tube **2** is passed through the nasal passage **6**, the throat **7**, and through the esophagus **8** into the stomach **9**, with the duodenum extension **30** passing through the pyloric orifice **10** into the upper portion of the duodenum **11**. Outside communication with the passageways **31** and **41** is through the duodenum and stomach branches **3** and **4**, respectively, Fig. 1.

With tube **2** in place as shown in Fig. 1, the duodenum and stomach are vented separately through branches **3** and **4**, respectively, which may be both left open during and shortly following insertion of the tube to permit escape of the gases of distention. Breathing may take place freely through the remaining nostril; moreover, the patient may swallow in the usual way.

Intestinal deflation

In order to assist in an alleviation of the distended and blocked intestinal condition, as well as to remove the toxic liquid, and to enable the attendant to note the rate at which gas is removed from the duodenum, the suction and receiving bottles **18** and **25** are provided and interconnected as shown. Suction bottle **18**, initially nearly full of water or other suitable liquid, is stoppered and connected with receiving bottle **25** by the glass discharge tube **21**, rubber tube **22**, and inlet tube **23**. Vent tube **20**, long enough to extend above the level of the liquid **19** when the suction bottle is inverted, is connected by a rubber tube to the duodenum branch **3** of duplex treatment tube **2**, by way of the Y tube **15**. The tubing **16** connected to the lower arm of branch tube **15** is normally closed by clamp **17**, which clamp may be transferred to branch **3** or **3'**, under circumstances to be discussed subsequently.

When the above preparations have been made, the suction bottle **18** may be inverted and elevated above the level of receiving bottle **25**, causing liquid to flow from suction bottle **18**, through tubes **21** to **23**, into receiving bottle **25**. Bottle **25** is vented to atmosphere by tube **24**. This flow causes the air in bottle **18** above the level of liquid **19** to become somewhat rarefied, whereupon the flow ceases except as gas is drawn through passageway **31** in tube **2** from the duodenum **11**. The suction thus effected according to the difference in elevation between bottles **18** and **25** is applied through branch **3** and contained passageway **31** to the duodenum. The rate at which the liquid level recedes in bottle **18** and builds up in bottle **25**, indicates somewhat closely the rate at which gas is being removed from the duodenum. It should be kept in mind that the tubing interconnecting bottles **18** and **25** is sufficiently small so that it remains filled with liquid to prevent air from bubbling upward into the upper bottle from the lower.

The capacity of each of the bottles **18** and **25** may be on the order of four quarts, enabling one filling to last for a considerable time, as the liquid ordinarily descends drop by drop, as indicated at **26**, into accumulated liquid **27**. The drops, however, are more often further apart than is indicated in the illustration.

The removal of the toxic liquid from the duodenum stops the previous rapid passage of the poisonous substance into the body, while the gently deflated condition of the duodenum resulting from the mild suction applied thereto as illustrated and as above described permits the entire portion of the small intestine above the distension-induced blockade to return to normal size, which results reliably in alleviation of the blocked condition, as one turn after another of the small intestine loses its gas of distention, giving room for the blocked or isolated section to rotate back to normal position and open the blockade.

The removal of gas and toxic matter from the duodenum is often interfered with by plugs of mucous and other particles lodging in the perforations **34** (Figs. 1, 2, and 4). When the stoppage at the perforations **34** becomes great enough to interfere with the removal of gas and regurgitated liquid from the duodenum, the level of liquid **19** becomes more or less stationary. When this occurs, the clamp **17** may be transferred from tube **16** to tube **3'** to enable the duodenum passageway through tube **2** to be cleaned by applying a suitable hand pump to tube **16**. At this point, it may be noted that perforations **34**, while collectively larger than the area of the duodenum passageway in the treatment tube, are each enough smaller so that any particle which will pass through a perforation will pass readily through the tube.

After the perforations have been unplugged, by alternate pressure and suction surges from the pump, clamp **17** may be transferred back to tube **16** to permit the further removal of gas and fluid by gentle and continuous suction.

Stomach venting and feeding

In order to maintain the stomach continuously vented while permitting liquid, with or without nourishment, to be supplied slowly to it, the stoppered and inverted feeding bottle **12** is provided for connection to the stomach branch **4** of the treatment tube **2**. Feeding bottle **12** is vented to the atmosphere by tube **14**, long enough to extend above the level of the liquid. The liquid may flow from the submerged tube **13** into the interconnected branch **4**, and thence by way of stomach passageway **41** (Figs. 3 and 4) and perforations **33** (Figs. 1, 2, and 4) to the stomach **9**. The stomach may thus perform its normal absorptive functions. Screw clamp **50** may be adjusted to control the rate at which liquid is supplied to the stomach.

The elevation of feeding bottle **14** above the stomach is preferably small, whereby any gas accumulating in the stomach during feeding may escape by flowing intermittently back up

the stomach passageway 41 in the tube against the slight feeding pressure, bubbling up through the liquid in the bottle 12 to escape to atmosphere through vent tube 14. Moreover, the discharge of substantial amounts of gas from the stomach may be noted by this bubbling in bottle 12. The attendant thus has continuous visual notification of the progress of intestinal and stomach venting and of the feeding.

In addition to providing nourishment for the system, the stomach feeding supplies the necessary liquid to compensate for losses of body fluids. Distilled water may be fed into the stomach and readily absorbed thereby.

At intervals during the giving of the treatment, gas pockets in the intermediate intestinal portion may be opened into the duodenum causing a sufficient surge to carry toxic liquid and gas back up through the pylorus into the stomach. The peristaltic action from stomach to duodenum may be depended on to pass the toxic liquid back to the duodenum to permit its removal by way of the duodenum passageway of the tube 2. The attendant however should remove the feeding bottle 12 at this time and replace the liquid therein with a fresh supply, for enough back flow of toxic liquid from the stomach may occur to cause contamination. The fresh liquid flowing into the stomach assists in "washing" the toxic liquid back into the duodenum to be removed as above described.

Modified forms of duplex tube

Figure 5 shows a section of a desirable modification of the duplex treatment tube, indicated generally by the reference character 500, while Fig. 6 shows a sectional view taken at the line 6—6 of Fig. 5.

The stomach perforations in the tube wall are indicated at 533, and the duodenum extension at 530. The duodenum and stomach passageways are indicated in Fig. 6 as 531 and 541, respectively.

Figures 7 and 8 show a second desirable modification of the duplex treatment tube, while Figs. 9 and 10 show a third.

The modified forms of the duplex treatment tube are similar to the preferred embodiment indicated at 2 in Figs. 1 to 4, except in cross-section. Generally, the smaller and more nearly round the tube, the easier it can be inserted. Figures 1 to 4 and Figs. 7 and 8 show tubes circular cross-section, but in these tubes the inclusion of the smaller stomach passageway within the circular outline containing the duodenum passageway narrows the latter passageway somewhat in one direction, possibly rendering it more susceptible to occasional stoppage by food particles and the like which may coalesce into a larger mass after being drawn in from the duodenum. Since the stomach passageway need not be large, it may be contained in a small tube adherent to the main tube and lying parallel to and outside the circular outline of the duodenum passageway as in Figs. 5 and 6, or it may be of crescent-shaped cross-section as in the modification shown in Figs. 9 and 10. These arrangements prove quite satisfactory provided the tube is properly inserted in the nostril, as the somewhat flattened or oval shape of the tube conforms rather closely to the shape of the nostril. The throat and esophagus pass any of the tubes quite readily, as they are of small section compared to relatively large objects which may be swallowed readily.

A feature of the duodenum extension is that the tip thereof is weighted by the weight 28 to facilitate the insertion thereof into the duodenum. When the patient is turned on his right side, with the tube inserted as far as the stomach, the weighted tip of the duodenum extension 30 falls easily through the pylorus and passes into the duodenum as the tube is gently urged into final position.

The length of the duodenum extension, while not critical, should be about five inches in the normal adult size, and the farthest duodenum perforations 34 should be not more than two and one-fourth inches from the tip, keeping in mind that the tube cannot be easily passed into the duodenum much more than this distance because of the backward and downward bend in the first or superior portion to join the second or descending portion. No perforation of the duodenum extension may be permitted to remain on the stomach side of the pyloric orifice, for the suction applied as hereinbefore pointed out is then applied also to the stomach. This causes air to be swallowed more or less continuously, not only giving a false reading in the liquid level in the suction and receiving bottles 18 and 25, but also reducing and more or less nullifying the suction as applied to secure deflation of the duodenum. It may be noted, however, that the presence of a stomach-passageway perforation 33 in the esophagus ordinarily has no adverse effect on the treatment.

What I claim is:

1. A duplex gastro-intestinal treatment tube for insertion through the esophagus into the stomach, said tube containing parallel passageways, one passageway adapted to terminate in the stomach when the tube is in position and being in open communication with the stomach interior through a perforation in the wall of the passageway, said tube having an extension adapted to carry the other passageway into the duodenum and into open communication therewith when the tube is in position, the wall of said other passageway being imperforate in the portion thereof lying within the stomach.

2. In a gastro-intestinal treatment system, tube means adapted to afford a passageway from the outside to and in open communication with the duodenum through a nasal passage, the throat, the esophagus, and the stomach, said tube means adapted to afford a parallel passageway from the outside into and ending within and in open communication with the stomach.

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