Device for treating obesity and motor disorders of the stomach
Vorrichtung zur Behandlung von Fettleibigkeit und motorischen Störungen des Magens
Dispositif de traitement de l'obésité et des troubles moteurs de l'estomac

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Proprietor: Cigaina, Valerio
I-31050 Villorba (Treviso) (IT)

Inventor: Cigaina, Valerio
I-31050 Villorba (Treviso) (IT)

Representative:
Rapisardi, Mariacristina
Ufficio Brevetti Rapisardi S.r.l.,
Largo V. Alpini, 15
20145 Milano (IT)

References cited:

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Description

[0001] The present invention relates to a device for treating obesity and syndromes related to motor disorders of the stomach of a patient. As is known, the treatment of obesity related to hyperalimentation, i.e. to a subject who introduces food in excess of his actual caloric requirements (energy expenditure related to motor activity, work, environmental activity, etc.) is based on psychotherapeutic, pharmacological or dietary provisions or, in selected cases (pathogenic obesity), on surgical provisions.

[0002] The modern surgical orientation (surgery is the only therapy that ensures real results in patients who have exceeded obesity values close to, or in excess of, 40 BMI, i.e. the ratio of weight to the square of the height) entails the reduction of gastric compliance, with the aim of limiting the subject's ability to ingest food, or of reducing the food absorption surface by shortening or bypassing part of the digestive canal; both aims are sought in some surgical procedures.

[0003] All of the surgical procedures currently in use have some immediate and/or delayed risks and must be considered as an extreme solution.

[0004] Furthermore, even surgical treatment fails sometimes, since the patient becomes fat again or the complications are such as to force the surgeon to restore the original anatomical situation, with the consequence of failing to achieve the intended aim of reaching the ideal weight.

[0005] The aim of the present invention is to avoid the drawbacks of a highly invasive surgical technique by providing a device which substantially aid the patient, in the case of obesity treatment, in achieving a more correct and functional nutritional pattern, preventing the emptying of the stomach or slowing down the transit of gastric content and furthermore, by means of different gastric visceral placements of the connecting means, allows to treat syndromes related to motor disorders of the stomach, such as duodenogastric and gastroesophageal refluxes and relapsing duodenal peptic disorders (ulcer or phlogosis).

[0006] Within the scope of this aim, an important object of the present invention is to provide a device for treating obesity and syndromes related to motor disorders of the stomach which give the patient high assurance of results, avoiding the drawbacks of mutilating operations.

[0007] A further object of the present invention is to provide a device for treating obesity and syndromes related to motor disorders of the stomach of a patient which can also be used for outpatients since they do not use current surgical techniques. US-A-4667686 discloses a cardiac stimulator that does not have an operating frequency comprised between 2 and 15 pulses per minute as claimed in claim 1.

[0008] This aim, these objects and others are substantially, achieved by a device for treating obesity and syndromes related to motor disorders of the stomach of a patient, as disclosed in the characterizing part of claim 1.

[0009] Further characteristics and advantages of the invention will become apparent with the description of a preferred but not exclusive embodiment of a device for treating obesity and syndromes related to motor disorders of the stomach of a patient, according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a sectional exemplifying view of a stomach;

Figure 2 is a schematic lateral elevation view of the terminal of the electrocatheter, or a means for connecting the electrical stimulator, shown in longitudinal cross-section;

Figures 3 and 4 are longitudinal sectional views of a different embodiment of the electrocatheter.

[0010] In order to further clarify the device for treating obesity and syndromes related to motor disorders of the stomach of a patient, according to the invention, the motor physiology of the gastric viscus is briefly described.

[0011] For the sake of simplicity, in the stomach 1 illustrated in Figure 1, the numeral 2 designates the esophagus, the numeral 3 designates the fundus ventriculi, the numeral 4 designates the cardia, the numeral 5 designates the gastric canal, the numeral 6 designates the corpus ventriculi, the numeral 7 designates the antrum of the stomach, the numeral 8 designates the pylorus, the numeral 9 designates the duodenum and the numeral 10 designates the mucous folds.

[0012] As is known, the stomach is divided into two parts as regards its motility: the fundus ventriculi, designated by the reference numeral 3, which has tonic wall movements, and the central part or corpus, designated by the reference numeral 6, which is characterized by phasic activity. Propulsive gastric movements begin in a point proximate to the greater curvature which is not clearly identified anatomically and is termed "gastric pacemaker".

[0013] The "gastric pacemaker" 13 sends electrical pulses (depolarization potential) approximately three times per minute; these pulses spread in an anterograde direction along the entire stomach in the form of waves 15 which have a sinusoidal shape.

[0014] The antrum 7 of the stomach has a continuous phasic activity which has the purpose of mixing the food which is present in the stomach. The passage of food into the duodenum 9 is therefore the result of a motility which is coordinated among the antrum 7, the pylorus 8 and the duodenum 9. To put it more simply, when the food has passed through the esophagus 2 it reaches the stomach.
The "gastric pacemaker" 13 spontaneously and naturally generates sinusoidal waves 15 along the entire stomach; these waves allow the antrum 7, with movements which are coordinated together with the pylorus 8 and the duodenum 9, to make the food pass into the subsequent portions of the alimentary canal.

Now that the known physiology of the gastric motility of a mammal, such as a human being, has been established, the device according to the invention consists in artificially altering, by means of sequential electrical pulses and for preset periods of time, the natural gastric motility of a patient and/or the time and manner of contraction of the lower esophageal and pyloric sphincters to prevent emptying or slow down gastric transit or prevent duodenal acidification during interdigestive phases or prevent gastric reflux in the last portion of the esophagus.

More particularly, the sequential electrical pulses are generated by an electrical stimulator which includes an electocatheter 20 which is applied by laparoscopic means to a portion of the seromuscular layer of the stomach of the patient (terminal 14 of the electocatheter 20 on the antrum 7). In this manner, the electrical stimulus generates, along the entire stomach 1, one or more sinusoidal waves 16 which start in the gastric antrum and add, more or less synchronously, to those which correspond to the natural electrical activity of the stomach when emptying procedures are activated in the stomach.

In other words, the electrical stimulator induces in the stomach a motor incoordination (so-called antral tachygastria) in order to slow down or even prevent gastric transit through the pylorus into the intestine located downstream and thus allow treatment of obesity related to hyperalimentation or modulate fasting gastric hypermotility for the treatment of relapsing duodenal ulcer in anxious subjects, or improve the functionality of the lower esophageal and/or pyloric sphincters in treating reflux esophagitis and gastropathy induced by duodenogastric reflux.

Therefore, the electrical stimulator, according to the motor phenomenon to be corrected (induction of antral tachygastria in obesity, modulation of gastric hypermotility in anxious subjects, increase in sphincter function in reflux disorders), has a purpose-specific and potentially patient-specific frequency, intensity, duration and period of stimulation, in addition to having a specific gastric location for the tip of the electocatheter according to the type of disorder.

It is furthermore specified that the stimulator can be programmed both for continuous stimulation and for "on demand" stimulation, i.e. at the onset of a particular electrical activity which can be detected by the stimulator itself through the electocatheter.

Furthermore, the electrical stimulator, in order to allow to perform iatrogenic tachygastria, has a preset operating frequency and period which may obviously vary according to the alteration of stomach motility to be obtained and/or to the pathological condition of the patient.

More precisely, the electrical stimulator has an operating frequency comprised between 2 and 15 pulses per minute. Considering that the natural pacemaker 13 is subject to electrical depolarization approximately three times per minute, and that this depolarization is transmitted with an anterograde direction in the entire viscus, the electrical stimulator must have an operating frequency substantially close to, and/or higher than, three pulses per minute. Each one of these electrical pulses has a duration comprised between 10 and 90 milliseconds and in particular a duration of 50 milliseconds.

The electrical discharge of each pulse can vary from approximately 1 to 5 volts (voltage-controlled stimulation) and from 2 to 15 milliamperes with constant current. Conveniently, the electocatheter 20 can be applied in the distal portion of the antrum even on outpatients, since this portion is easily visible during laparoscopy.

As shown, therefore, in order to produce antral tachygastria for limited intervals within a 24-hour period, and prevent or slow down stomach emptying, the viscus of the patient is stimulated electrically as described above.

In this case, the obese patient may use his normal gastric motor activity only when electrical stimulation ceases.

Since water requires no digestive process and produces no peristaltic activity (an experimental finding), it can pass from the stomach into the duodenum (short operating intervals of the electrical stimulator can be used to facilitate this transit).

In particular the device for treating obesity and syndromes related to motor disorders of the stomach of a patient, as described, includes an electrical stimulator which is appropriately located subcutaneously in the abdominal wall, is anchored to the fascia of the musculus rectus abdominis, and is connected to the distal gastric antrum by means of an electocatheter 20 the terminal portion thereof of which is provided with metalic micro-barbs 21, for example two, which are angled so as to allow application of the tip of the catheter and prevent its extraction. For this purpose, the remaining portion of the electocatheter is covered by a sheath 22 made of inert and biocompatible plastic material which has, in the part proximate to its tip, a small expansion 23 with a non-uniform velveted surface for anchoring with a stitch in order to ensure lasting adhesion of the electocatheter to the viscus. The rough surface of the expansion 23 has the purpose of producing a fibrous reaction of the gastric serosa, contributing to the firmness of the anchoring.

In a different embodiment, the electocatheter 20 is provided with a terminal portion having a reversible and non-traumatic anchoring system, as shown in Figures 3 and 4.
[0029] For this purpose, the entire electrocatheter is covered by a second sheath, made of inert and biocompatible plastic material, which allows its application even during the diagnostic phase, since the anchoring can be reversible and the electrocatheter is therefore removable.

[0030] The expression "diagnostic phase" designates electromyographic study of the viscera with application of visceral electrocatheters in a monopolistic system.

[0031] More in detail, the electrocatheter 20 has a stimulating conductor 30 which is provided with a tip 31 and is covered by a first insulating sheath 32.

[0032] A second insulating sheath 33, made of flexible metallic material (spiral spring), forms the return conductor of the electrocatheter.

[0033] A ferrule 34 is fitted on the second sheath 33 and is provided with laminas which can move and retract and are elastically resilient so that they can protrude through openings or slots 35 formed on a flexible tubular slider 36 (spiral spring) which is suitable, by means of a rigid cylinder 36b provided with inclined planes, to move the laminas into a divaricated or closed position with respect to the axis of the stimulating conducting wire by means of its translatory motion along the catheter body.

[0034] These laminas are the means for the electrical connection of the return conducting wire, which is thus in contact, like the stimulating conducting wire, with the tissues of the sub-serosal layer of the gastric wall. The metallic ferrule 34 continues, with the same diameter, by means of the insulation 38 along the entire length of the catheter.

[0035] In particular, the laminas have ends 37 which are inclined to allow engagement with the slider 36.

[0036] For the application of the electrocatheter 20 it is recommendable to first produce a wheal with physiological solution and cortisone on the serosal surface of the stomach, in order to avoid unwanted perforation of the viscus, limit the insertion of the tip of the catheter to the sub-serosal layer of the viscus, and reduce tissue impedance.

[0037] The operating parameters of the device can be adjusted with an external programmer, and the electrical stimulator can be activated and/or deactivated with a magnet, as it occurs for example for medullary stimulators.

[0038] The invention achieves the intended aim and objects and achieves numerous important advantages.

[0039] The device for treating obesity and syndromes related to motor disorders of the stomach of a patient have in fact been provided which avoid many of the drawbacks and contraindications of current operations, which are designed to change alimentary physiology by altering the normal anatomy of a patient.

[0040] Furthermore, the application of the device is not particularly difficult to perform, since a simple operative laparoscopy allows endoabdominal application of an electrocatheter and a simple surgical maneuver allows the implantation of an electrical stimulator on the surface of the abdominal wall, particularly anchored on the fascia of the musculus rectus abdominis.

[0041] The invasiveness of the procedure always remains considerably lower than that of a bariatric operation.

[0042] It is furthermore stressed that the possibility of altering gastric motility with electrical stimulations implies that the device is applicable in disorders such as relapsing peptic duodenal ulcer of anxious subjects, gastric peptic disorders induced by duodenogastric reflux, and esophageal peptic disorders induced by gastroesophageal reflux.

[0043] As regards the first disorder, if we consider that duodenal ulcer is the consequence of an alteration in gastric motility which leads to acidification of the duodenum caused by the emptying of gastric juice into the duodenum during interdigestive phases, this disorder can be treated by inducing antral tachygastria in response to a pathological increase in the frequency induced by the natural pacemaker, which is typical of the anxious condition, thus slowing down a hyperperistasis which is not required by any digestive process but is merely the consequence of a cortical conditioned reflex.

[0044] In this case, particular characteristics are provided for the electrocatheter and for its placement, in addition to a different programming of the electrical stimulator, which will have to act in response to a particular recorded electrical activity.

[0045] The electrocatheter, which is always appropriately sheathed, is placed so that it has three points of seromuscular contact (on the longitudinal line) and thus also three openings or slots with no sheath (two poles for the bipolar type and one pole for the monopolar type) for reception and/or stimulation: one on the greater curvature in the region of the natural pacemaker, and two in the antral region, so that both can receive and the bipolar one can stimulate. It is obvious that the insertion of the third pole requires a further flexible conductor similar to 33, an insulating sheath similar to 38 and a metallic ferrule to ensure contact of the third pole with the seromuscular layer.

[0046] The purpose to be accomplished is therefore to prevent the vissus from emptying its acid liquid during interdigestive phases into the duodenum, which is physiologically alkaline, in the same conditions: in order to achieve this purpose, pathological hyperperistalsis is stopped or slowed down by inducing, with an artificial ectopic pacemaker, an antral tachygastria during which it has been extensively demonstrated that no propulsive peristaltic movements are recorded.

[0047] For reflux disorders, the electrical stimulator is used during digestive rest phases, for example in the early hours of the morning during nocturnal rest, and is always appropriately programmed and designed for sphincter release at the onset of upstream peristaltic activity; this is done to avoid incurring in another disorder, such as esophageal achalasia.
The same principle holds for duodenogastric biliary reflux.

An electrocatheter with a recording point assesses electrical and/or mechanical activity by means of a monopolar terminal and/or a transducer of the muscular mechanical tension of the antrum, which acts as guide for the duration of the pyloric stimulation which is performed from a bipolar opening of the catheter.

The device thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the present claims.

Furthermore, all the details may be replaced with technically equivalent elements. The materials employed, the shapes and the dimensions may be any according to the requirements.

Claims

1. Device for treating obesity and syndromes related to motor disorders of the stomach (1) of a patient, characterized in that it comprises an electrical stimulator which is provided with means (20) for connecting it at the level of the distal antrum (7) of the stomach or of other points of the stomach according to the disorder to be treated, also by laparoscopic means, said stimulator having an operating frequency comprised between 2 and 15 pulses per minute in order to eliminate or reduce the motility of said stomach so as to slow down or prevent food transit therein or improve the function of the lower esophageal or pyloric sphincters or prevent acidification of the duodenum for a preset time.

2. Device according to claim 1, characterized in that said connecting means comprises an electrocatheter (20) the tip thereof being inserted in the seromuscular layer of the gastric antrum.

3. Device according to claim 2, characterized in that each one of said pulses has a discharge comprised between 2 and 15 milliamperes with constant current and between 1 and 10 volts with controlled voltage, according to the electrical characteristics of the catheter used and to a specific rheobase of the tissue to be stimulated.

4. Device according to claim 2 or 3, characterized in that said electrocatheter (20) has an internal conductor (30) the end of which has a metallic conducting tip (31) from which appropriately angled metallic micro-barbs (21) extend, said barbs being pointed but not sharp and stabilizing the contact.

5. Device according to claim 2, characterized in that said electrocatheter has a sheath (22) made of inert and biocompatible plastic material which has, proximate to said metallic tip, a flat velveted expansion (23), made of plastic material, for anchoring on the gastric serosa with a surgical stitch.

6. Device according to one or more of the present claims, characterized in that said connecting means comprises an electrocatheter which has a first insulating sheath (32) to insulate said metallic tip, which acts as stimulating conductor, from a second metallic sheath (33), which acts as return conductor; said second sheath having, at its ends, a rigid cylinder (36b) with laminas which can open elastically and have an end (37) which is inclined so as to engage in the subserosal layer of the gastric wall when said laminas are disarticulated by an insulating and flexible tubular slider member (36) which wraps around said second metallic sheath and its insulation, and slides thereon in a guided manner, without rotating.

7. Device according to claim 6, characterized in that said tubular slider member has a number of openings or slots (35) equal to the number of inclined laminas to allow therein disarticulation with respect to the surface of said electrocatheter.

8. Device according to one or more of the present claims, characterized in that said electrocatheter, in case of duodenal ulcer, has up to three points of seromuscular contact and the corresponding openings on said tubular slider for reception and/or stimulation of said stomach.

9. Device according to one or more of the claim 2 to 8, characterized in that said electrocatheter comprises a monopolar terminal or a transducer of muscular tension or of muscular mechanical movement to assess the electrical and/or mechanical activity of a portion of the viscus in order to determine the sphincter stimulation time by means of a bipolar opening provided on said tubular slider.

10. Device according to one or more of the claim 2 to 8, characterized in that said electrocatheter can be connected to an external receiver-programmer or receiver-recorder to adjust its parameters and/or assess the myoelectric activity of the stomach.

Patentansprüche

1. Vorrichtung zur Behandlung von Fettleibigkeit und Syndromen, die mit motorischen Störungen des Magens (1) eines Patienten zusammenhängen, dadurch gekennzeichnet, daß sie einen elektrischen Stimulator aufweist, der mit einem Mittel (20) ausgestattet ist, um ihn auf der Höhe des distalen Antrums (7) des Magens oder anderer Punkte des Magens je nach der zu behandelnden Störung anzuschließen, sowie auch ein laparoskopisches
Mittel, wobei der Stimulator eine Betriebsfrequenz zwischen 2 und 15 Impulsen pro Minute hat, um die Motilität des Magens zu beseitigen oder zu verrin- gern, so daß der Durchgang von Nahrung in ihm verlangsamt oder verhindert wird oder die Funktion der unteren ösophagischen oder pilorischen Sphinkter verbessert wird oder die Ansäuerung des Duodenums über eine voreingestellte Zeit hinweg verhindert wird.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Verbindungsmittel einen Elektrokatheter (20) aufweist, dessen Spitze in die seromuskuläre Schicht des gastrischen Antrums eingefügt ist.


4. Vorrichtung nach Anspruch 2 oder 3, dadurch gekennzeichnet, daß der Elektrokatheter (20) einen inneren Leiter (30) hat, dessen Ende eine leitende Metallspitze (31) hat, von der sich metallische Mikro-Spitzen (21) in einem geeigneten Winkel erstrecken, die zwar spitzig, aber nicht scharf sind und den Kontakt stabilisieren.

5. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß der Elektrokatheter einen Schaft (22) aus inertem und biokompatiblen Kunststoffmaterial hat, der nahe an der Metallspitze eine aus Kunststoffmaterial bestehende flache samtartige Ausweitung (23) für die Verankerung an der gastrischen Serosa mit einer chirurgischen Naht hat.

6. Vorrichtung nach einem oder mehreren der vorliegenden Ansprüche, dadurch gekennzeichnet, daß das Verbindungs-mittel einen Elektrokatheter aufweist, der einen ersten Isoliertschaft (32) hat zum Isolieren der Metallspitze, die als stimulierender Leiter wirkt, gegenüber einem zweiten metallischen Schaft (33), der als Rückkehrleiter wirkt; wobei der zweite Schaft an seinen Enden einen starren Zylinder (36b) mit Laminas hat, die sich elastisch öffnen können und ein Ende (37) haben, das geneigt ist, um mit der subserosalen Schicht der Magenwand in Eingriff zu gelangen, wenn die Laminas mittels eines isolierenden und bieg samen rohrförmigen Gliedes (36) divariziert werden, das sich um den zweiten metallischen Schaft und seine Isolierung wickelt und auf ihm ohne Drehung geführt gleitet.

7. Vorrichtung nach Anspruch 6, dadurch gekennzeichnet, daß das rohrförmige Glied die Anzahl Öffnungen oder Schlitze (35) hat, die gleich der Anzahl der geneigten Laminate sind, um in ihnen eine Divarizierung bezüglich der Oberfläche des Elektrokatheters zu ermöglichen.

8. Vorrichtung nach einem oder mehreren der vorliegenden Ansprüche, dadurch gekennzeichnet, daß der Elektrokatheter im Falle eines duodenalen Geschwürs bis zu drei Punkte für seromuskulären Kontakt sowie die entsprechenden Öffnungen an dem rohrförmigen Gleiter zur Aufnahme und/oder Stimulation des Magens hat.

9. Vorrichtung nach einem oder mehreren der Ansprüche 2 bis 8, dadurch gekennzeichnet, daß der Elektrokatheter einen monopolaren Anschluß oder einen Wandler für die Muskelspannung oder die mechanische Muskelbewegung aufweist, um die elektrische und/oder mechanische Aktivität eines Abschnitts des Viskus zu bewerten, um die Sphinkter-Stimulationszeit mittels einer an dem rohrförmigen Gleiter angebrachten bipo- laren Öffnung zu bestimmen.

10. Vorrichtung nach einem oder mehreren der Ansprüche 2 bis 8, dadurch gekennzeichnet, daß der Elektrokatheter an einen externen Empfänger-Programmierer oder Empfänger-Rekorder angeschlossen werden kann, um seine Parameter ein- zustellen und/oder die myoelektrische Aktivität des Magens zu bewerten.

Revendications

1. Dispositif pour le traitement de l’obésité et des syndromes en relation avec des troubles moteurs de l’estomac (1) d’un patient caractérisé en ce qu’il comprend un stimulateur électrique qui est équipé d’un moyen (20) pour le relier au niveau de l’antre distal (7) de l’estomac ou d’autres points de l’estomac selon le trouble qui doit être traité, également d’un moyen laparoscopique, ce stimulateur ayant une fréquence de fonctionnement comprise entre 2 et 15 impulsions par minute de façon à éliminer ou à réduire la mobilité de l’estomac, pour y arrêter ou y empêcher le transit alimentaire ou pour améliorer le fonctionnement des sphincters de l’oesophage ou pylorique inférieur ou pour empêcher l’acidification du duodénum pendant une durée fixée à l’avance.

2. Dispositif selon la revendication 1, caractérisé en ce que
ce moyen de connexion comprend un électro-cathéter (20), la pointe de celui-ci étant insérée dans la couche seromusculaire de l’entre gastrique.

3. Dispositif selon la revendication 2, caractérisé en ce que chacune de ces impulsions a une décharge comprise entre 2 et 15 milliampères avec un courant constant et entre 1 et 10 volts avec un voltage contrôlé, en fonction des caractéristiques électriques du cathéter employé et de la rhéobase spécifique du tissu à stimuler.

4. Dispositif selon les revendications 2 ou 3, caractérisé en ce que cet électro-cathéter (20) a un conducteur interne (30) dont l’extrémité a une pointe conductrice métallique (31) à partir de laquelle s’étendent des micro-arêtes métalliques (21) formant un angle approprié, ces arêtes étant taillées en pointe mais non tranchantes et stabilisant le contact.

5. Dispositif selon la revendication 2, caractérisé en ce que cet électro-cathéter a un manchon protecteur (22) fait d’un matériau plastique inert et biocompatible qui a, à proximité de cette pointe métallique un développement plat velouté (23) fait de matériau plastique, pour l’ancrer sur la muqueuse gastrique à l’aide d’une suture chirurgicale.

6. Dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce que le moyen de connexion comprend un électro-cathéter qui a un premier manchon isolant (32) pour isoler la pointe métallique qui agit comme conducteur de stimulation, d’un second manchon métallique (33) qui agit comme conducteur de retour ; ce second manchon ayant à son extrémité, un cylindre rigide (36b) avec des feuillets qui peuvent s’ouvrir d’une manière élastique et qui ont une extrémité (37) qui est inclinée pour s’engager dans la couche sous-séreuse de la paroi gastrique lorsque ces feuillets sont détournés par un élément de curseur tubulaire flexible et isolant (36) qui s’enveloppe autour du second manchon métallique et de son isolation et qui glisse dessus d’une manière guidée, sans tourner.

7. Dispositif selon la revendication 6, caractérisé en ce que l’élément de curseur tubulaire possède un certain nombre d’ouvertures ou d’entailles (35) égal au nombre de ces feuillets inclinés pour y permettre la bifurcation relativement à la surface de cet électro-cathéter.

8. Dispositif selon l’une ou plusieurs des présentes revendications, caractérisé en ce que cet électro-cathéter, dans le cas d’ulcère duodénal possède jusqu’à trois points de contact seromusculaire et les ouvertures correspondantes sur ce curseur tubulaire pour la réception et/ou la stimulation de cet estomac.

9. Dispositif selon l’une ou plusieurs des revendications 2 à 8, caractérisé en ce que cet électro-cathéter comprend une borne monopolaire ou un enregistreur de tension musculaire ou de mouvement mécanique musculaire pour déterminer l’activité électrique et/ou mécanique d’une portion de "viscère" de façon à déterminer le moment de stimulation du sphincter à l’aide d’une ouverture bipolaire prévue sur ce curseur tubulaire.

10. Dispositif selon l’une ou plusieurs des revendications 2 à 8, caractérisé en ce que cet électro-cathéter, peut être connecté à un programmateur-récepteur ou un enregistreur-récepteur externe pour mettre au point ses paramètres et/ou déterminer l’activité myoélectrique de l’estomac.