The present invention relates to an endoscope which has a movement apparatus (2) enabling easy progress and movement ability in the area in which it is applied by comprising apparatus legs (2.1) and the apparatus arms (2.2) that have the ability to operate independent from each other in order to be used in endoscopy operations.
— before the expiration of the time limit for amending the
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amendments (Rule 48.2(h))
AN ENDOSCOPE WITH MOVEMENT APPARATUS

Field of the Invention

The present invention relates to an endoscope with movement apparatus which is designed to be used in endoscopy operations and has the ability to progress easily and movement ability in the area where it is applied.

Background of the Invention

In its most general definition, the tools enabling to examine the internal organs via the light and the camera it comprises are called as endoscope, and this application is called as endoscopy.

Endoscopy can named differently according to the area/organ to which it is applied. For example, if the application area of the endoscopy is stomach, it is called as gastrosccpy; if it is bronchia, it is called as bronchoscopy; if it is uterus, it is called as hysteroscopy; if it is abdominal cavity, it is called as laparoscopy etc.

Endoscopes have great importance and requirement in medicine in terms of accurate diagnosis on patients, thus administering right treatment. Especially, today, when it is considered that large part of cancer diseases develops in gastrointestinal system and early diagnosis is accepted as the most important element in treatment, it will be understood that endoscopy process is of vital importance.
Even though there are various methods for early diagnosis in both cancer and benign diseases of gastrointestinal tractus, the most important means for diagnosis are endoscopic operations which can perform diagnosis and the treatment at the same time. These are upper endoscopy (esophagus gastrodudenoscopy and enteroscopy) and lower endoscopy (colonoscopy) attempts.

However, one of the most important factors determining the success of endoscopy process is the structure of the endoscope device. Since especially the early models of endoscopes did not have adequate flexibility, they prevented to reach the point where it is exactly wanted to be reached in areas having corrugated and soft structure such as especially gastrointestinal system.

Endoscopy application can create a problematic process for both patients and the doctor. These disadvantages increase especially in narrow and corrugated areas such as intestines, esophagus etc.

The success to reaching the area wanted to be examined as it moves away from the mouth in upper endoscopy and from the anus in lower endoscopy. For this reason, small intestines are the parts which are viewed in a most difficult way endoscopically.

For this reason, bendable, more flexible forms have been designed by making improvements on the endoscopes. The inventions No 2008/09223 and titled "Endoscope", and No CN201037S77 and titled "Endoscope with Flexible fiber channel" are examples for these designs.
Inventions No JP2 010051534 and titled "Actuator for intraductal moving body and endoscope", and N JP2 006158971 and titled "Endoscope with rotatable terminal head" can be given as examples for the other improvements which have been made on endoscopes in the state of the art.

Together with the improvements made on the endoscopes, as it can be seen from the invention No 2011/10915 and titled "Self moving device", there are additional apparatus which are developed to provide advantages for the endoscopes.

However, in spite of all improvements made on the devices, the problems experienced in endoscopy process continue due to reasons such as the area on which the process is applied and the status of the case. The most challenging condition of the endoscopy process for both patient and the doctor is to reach the endoscope to the necessary part in the body. Endoscopes are generally inserted into the patient's body through mouth or anus according to the area of application, and it is moved inside the body until it reaches the organ/area to be examined. At this stage, local or general anesthesia, when it is necessary, is applied for several reasons such as decreasing trauma on the patient, preventing body reflex etc. Even though this situation provides relative convenience for the patient, it does not provide important contribution in managing the endoscope for the doctor.

In spite of these improvements, another important reason for not being able to provide success is that the endoscopes are tried to reach the desired area by being pushed from behind due to their design. Even if the endoscope has a flexible structure, it is applied by pushing from behind in a tubular structure. This situation is roughly similar to push cloth rubber into the cloth from behind. However, this process can
be practical by attaching a small material at the end of the rubber. Briefly, pulling endoscope from front is also practical and rational in endoscopy process as it is in the example. Otherwise, the patient is traumatized and the operation becomes very troublesome for the doctor as well as the desired success is not achieved.

The mechanisms that can enable the movement of the endoscopes are described in patent applications Nos. US2005/0154278, DS5571114 in the state of the art. Said mechanisms comprise movement elements located around the endoscope. The movement members are guided by an actuator located on the endoscope body. This situation allows all movement members located around the endoscope being controlled from a single center and as a whole. Guiding movement members as a whole only provides pushing force to the endoscope and does not contribute to maneuver ability.

For example, the movement member disclosed in application No US2005/0154278 comprises an actuator inside the endoscope body. The related actuator provides movement for all movement members connected to itself. The actuator moves all movement members connected to itself at a certain speed toward the front upon front movement command of the endoscope user. However, in case of using this system, there is no possibility to keep one of the movement members fixed or towards the opposite direction. Therefore the maneuver ability of the system decreases.

Another technical problem experienced in the product disclosed in the application No US2005/0154278 is that the distances and the locations of the arms of the movement members which are connected to the endoscope body are fixed. Therefore, the
movement ability of the system can be low since it is not possible to modify the distances and locations of the arms.

5 **Objective of the Invention:**

The objective of the invention is to provide access to all areas to which it will be applied, especially to the small intestines which are the hardest part to examine by enabling the endoscope that is tried to be reached to the target by only being pushed from the behind to be pulled from the front at the same time by means of the movement apparatus it has. By this means;

15 * physical and mental traumas such as loop (tissue deformation in a ring-like form which can form on some organs) which is one of the most important problems created by endoscopy on the patient, especially in colonoscopy and enteroscopy will be minimized;

20 • the effort and time consumed by the doctor will be minimized;

• the doctor can move endoscope easily in corrugated and narrow organs such as both colon and small intestine without forming any tissue trauma and without requiring to exert much effort;

• the control of the doctor is maximized and the endoscope will be reached to the point exactly where it is wanted quickly and practically, therefore diagnosis and treatment will be provided in the most accurate way;
it will allow the area being examined to be scanned in different angles in much broader area surface by means of the movement ability it has even after the endoscope reaches the related area.

The advantaged provided by the invention in terms of scanning will also be valid in case the device is to be used for operation-treatment purposes.

Description of the Figures

Figure 1. Front perspective view of the endoscope

The components shown in the abovementioned figures are each given reference numbers, and the components corresponding to these reference numbers are as follows:

Endoscope end
1.1 Camera
1.2. Light

2. Movement apparatus
2.1. Apparatus leg
2.1.1. Clasping ends
2.2. Apparatus arm
2.2.1. Endoscope connecting piece

Description of the Invention

According to the invention, the endoscope comprises endoscope end (1) having at least one camera (1.1) which enables imaging and at least one light (1.2) which enables lighting; movement
apparatus (2) having at least one apparatus leg (2.1) enabling the movement of the endoscope, and apparatus arm (2.2) determining the operational area and movement location of the apparatus leg (2.1) by being provided between the apparatus leg (2.1) and the endoscope end (1) in order to provide the connections.

The movement apparatus (2) can have more than one apparatus legs (2.1) as well as it can be used with one apparatus leg (2.1). In multiple use of the apparatus legs (2.1), each apparatus leg (2.1) has one apparatus arm (2.2). In this way, each apparatus leg (2.1) can realize its own movement independently.

The apparatus arms (2.2) adjust the distances of the apparatus legs (2.1) to the endoscope by taking the endoscope end (1) as basis, as well enabling the apparatus legs (2.1) connected thereto to operate independently. By means of the mechanism such as spring etc. comprised by the apparatus arm (2.2) in its configuration, it enables the apparatus leg (2.1) to fit on the surface of the area (organ) being operated in an optimum way. For example, if the area being operated is intestine, the apparatus arm (2.2) pushes the apparatus leg (2.1) towards the intestinal wall with an appropriate force and enables it to fit into the inner surface of the intestine in an optimum way. This structure enables each apparatus leg (2.1) to locate itself to the area where the endoscope operates; when the endoscope is directed towards a narrow area, the apparatus arms (2.2) form an acute angle and enable the apparatus leg (2.1) connected to itself to move in confined space. On the contrary, when it forms a wide angle with the endoscope end (1), the apparatus leg (2.1) will move in wide area.
The movement apparatus (2), as given in an example of our invention presented in the figures, can be designed in a structure like a palette wherein the clasping ends (2.1.1) are provided on the outer part of the apparatus legs (2.1) and the elements enabling its movement are provided on the inner part. These actuating components can be comprised of electric motors operating with electricity which can be formed of structures generating movement and maneuver such as wheel, sphere etc. Actuating components start the movement inside the apparatus leg (2.1) in which they are located just as it is in vehicle palettes, and they will enable the apparatus legs (2.1) to move.

Each apparatus leg (2.1) can be controlled separately being independent from each other and their separate back and forth movements can be directed. For example, the apparatus leg (2.1) on one side rotates forward while another apparatus leg (2.1) located on the opposite side is operated in backward direction, therefore the endoscope will be enabled to rotate sharp corners which are difficult to turn such as colon flexuras more easily. At the same time, the desired apparatus leg/legs (2.1) can be stopped when it is necessary, the desired apparatus leg/legs (2.1) can continue its operation.

The clasping ends (2.1.1) can be added on the apparatus leg (2.1) which will enable to make maneuver easily without slipping on the body tissues being contacted by means of being formed of structures such as protrusion, tooth etc. and which will not damage the tissues. The clasping ends (2.1.1) can be designed integrated with the apparatus legs (2.1) as well as they can be external structures that can be positioned on the
outer part of the apparatus legs (2.2) as it is presented in the example.

The movement apparatus (2) is attached to the endoscope end (1), and it will pull the endoscope from the behind while progressing in accordance with the commands given by the endoscopist inside the intestinal lumen. The endoscope which can currently move by being pushed from behind will progress easily once it is also pulled from the front, and formations such as loop etc. causing problem especially in lower endoscopy will be avoided.

The movement apparatus (2) can also be manufactured separately such that it can be added to the present endoscopes with an endoscope connecting piece (2.2.1) as well as it can be manufactured integrally with the endoscope.
1. An endoscope end (1) having at least one camera (1.1) which enables imaging and at least one light (1.2) which enables lighting and at least one apparatus leg (2.1) which is attached to endoscope end (1) via apparatus arm (2.2) characterized in that it comprises actuating components for each apparatus leg (2.1) which enable each apparatus leg (2.1) to move back and forth separately, to stop or to operate.

2. An endoscope (1) according to Claim 1, characterized in that each apparatus leg (2.1) has at least one apparatus arm (2.2) belonging to itself.

3. An endoscope (1) according to Claim 1, characterized in comprising apparatus leg (2.1) positioning mechanism on the apparatus legs (2.1) which enables the distances of apparatus legs (2.1) to the endoscope to be adjusted.

4. An endoscope (1) according to Claim 3, characterized in that the apparatus leg (2.1) positioning mechanism can be a spring mechanism.

5. An endoscope (1) according to Claim 1, characterized in that the apparatus arms (2.2) can comprise an endoscope connecting piece (2.2.1) which enables connected to the endoscope end (1).

6. An endoscope (1) according to Claim 1, characterized in that the actuating components can be in form of a wheel or sphere.
7. An endoscope (1) according to Claim 1, characterized in that the actuating components are actuating components with palette.

8. An endoscope (8) according to Claim 7, characterized in that the actuating component with palette comprise clasping ends (2.1.1) on its outer part.

9. An endoscope (8) according to Claim 8, characterized in that the clasping ends (2.1.1) can be in form of a protrusion or tooth.

10. An endoscope (1) according to Claim 1, characterized in comprising actuating components on each apparatus leg (2.1) which enable each apparatus leg (2.1) to be controlled separately independent from each other and to direct their back and forth movement separately.
A. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both national classification and IPC

INV. A61B1/00

ADD.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Date of the actual completion of the international search

21 May 2015

Date of mailing of the international search report

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