there is a high amount of bending on the wire coil sheath, resulting in a narrowing of the area inside the wire coil sheath. The narrowing of the lumen due to the buckling / kinking of the wire coil sheath results in increased friction between the cable and the wire coil sheath, reducing the force transmission efficiency of the cable.

[0005] Thus, what is needed is an endoscope device and an endoscope system for that overcomes the above drawbacks. Furthermore, other desirable features and characteristics will become apparent from the subsequent detailed description and the appended claims, taken in conjunction with the accompanying drawings and this background of the disclosure.

SUMMARY

[0006] As disclosed, an endoscope system is provided. The endoscope system includes an endoscope, a flexible elongate member, one or more actuators and an anti-buckling tube. The endoscope has a hollow tube formed therein and has a first end coupleable to a docking station and a second distal end. The flexible elongate member is insertable through the hollow tube of the endoscope and has a first end for operational control and a second distal end for operation of robotic members at the distal end of the endoscope. The one or more actuators are coupleable to the flexible elongate member at the first end and are translatable in a direction parallel to a central axis of the hollow tube to allow fine movement of the second distal end of the flexible elongate member during operation. And the anti-buckling tube is arranged with respect to the hollow tube at the first end of the endoscope such that the flexible elongate member is inserted through the anti-buckling tube downstream of the one or more actuators to prevent buckling of the flexible elongate member during translation of the one or more actuators.

[0007] According to a first aspect of the present invention, an endoscope system is provided which includes an endoscope and a flexible elongate member. The endoscope has

a hollow tube formed therein for insertion of the flexible elongate member. The flexible elongate member has a first end for operational control and a second distal end for operation of robotic members at a distal end of the endoscope. The flexible elongate member also includes one or more flexible tendons to provide operational control from the first end to the robotic members at the second distal end, each of the one or more flexible tendons having a wire coil sheath which includes wire having a substantially rectangular cross section wound around a corresponding one of the one or more flexible tendons, wherein adjacent pitches of the wire contact each other, the substantially rectangular cross section having a cross-section area and configured to allow stable contact between the adjacent pitches, and wherein the wire coil sheath extends along each of the one or more flexible tendons from the first end to the second distal end of the flexible elongate member.

[0008] According to a second aspect of the present invention, a flexible elongate member for use in an endoscopy system is provided. The flexible elongate member has a first end for operational control and a second distal end for operation of robotic members at the second distal end. The flexible elongate member includes one or more flexible tendons to provide operational control from the first end to the robotic members at the second distal end. Each of the one or more flexible tendons has a wire coil sheath which includes wire having a substantially rectangular cross section wound around the corresponding one of the one or more flexible tendons, wherein adjacent pitches of the wire contact each other, the substantially rectangular cross section having a cross-section area configured to allow stable contact between the adjacent pitches, and wherein the

wire coil sheath extends along each of the one or more flexible tendons from the first end to the second distal end of the flexible elongate member.

[0009] As disclosed, an endoscope system is provided. The endoscope system includes an endoscope and a flexible elongate member. The endoscope has a hollow tube formed therein for insertion of the flexible elongate member. The flexible elongate member has a first end for operational control and is coupled to robotic members at a distal end of the endoscope for operation thereof. The flexible elongate member includes a rotational-motion transmitting device

forming a

shaft of the flexible elongate member for propagating actuation from the first end to the robotic members at the second distal end.

[0010] As disclosed, a flexible elongate member for use in an endoscopy system is provided. The flexible elongate member has a first end for operational control and is coupled to robotic members at a second distal end. The flexible elongate member includes a rotational-motion transmitting device forming a shaft of the flexible elongate member for propagating actuation from the first end to the robotic members at the second distal end.

[0011] As disclosed, an endoscope system is provided. The endoscope system includes an endoscope, a flexible elongate member and at least one anti-kink support. The endoscope has a hollow tube formed therein for insertion of the flexible elongate member. The flexible elongate member has a first end for operational control and a second distal end for operation of robotic members at a distal end of the endoscope. The flexible elongate member including one or more flexible tendons to provide operational control from the first end to the robotic members at the second distal end. The at least one anti-kink support is located on one of the one or more flexible tendons to enforce a minimum bend radius on the one of the one or more flexible tendons, the anti-kink support pivoting freely about the one of the one or more flexible tendons.

[0012] As disclosed, an endoscope system is provided. The endoscope system includes an endoscope, a flexible elongate member, at least one robotic member and coupling means for coupling the at least one robotic member to the flexible elongate member. The endoscope has a hollow tube formed therein. The flexible elongate member is insertable through the hollow tube and has a first end for operational control and a second distal end having a camera coupled thereto.

The at least one robotic member is located at the second distal end of the flexible elongate member and the coupling means couples the at least one robotic member to the flexible elongate member while constraining the robotic member to an asymmetric range of motion.

[0013] As disclosed, an endoscope system is provided. The endoscope system includes an endoscope, a flexible elongate member, at least one robotic member and torque joint means for coupling the at least one robotic member to the flexible elongate member. The endoscope has a hollow tube formed therein. The flexible elongate member is insertable through the hollow tube and has a first end for operational control and a second distal end. The at least one robotic member is located at the second distal end of the flexible elongate member and the torque joint means includes a centrally aligned pulley.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views and which together with the detailed description below are incorporated in and form part of the specification, serve to illustrate various embodiments and to explain various principles and advantages in accordance with present embodiments.

[0015] Figure 1 shows a schematic illustration providing a perspective view of an endoscopy system in accordance with a present embodiment.

[0016] Figure 2 shows a schematic illustration of a slave section of the endoscopy system of Figure 1 in accordance with the present embodiment.

CLAIMS

What is claimed is:

1. An endoscope system comprising:

an endoscope having a hollow tube formed therein; and

a flexible elongate member for insertion through the hollow tube, wherein the flexible elongate member has a first end for operational control and a second distal end for operation of robotic members at a distal end of the endoscope, the flexible elongate member including one or more flexible tendons to provide operational control from the first end to the robotic members at the second distal end, wherein each of the one or more flexible tendons has a wire coil sheath, the wire coil sheath comprising wire having a substantially rectangular cross section wound around the corresponding one of the one or more flexible tendons,

wherein adjacent pitches of the wire contact each other, the substantially rectangular cross section having a cross-section area and configured to allow stable contact between the adjacent pitches, and wherein the wire coil sheath extends along each of the one or more flexible tendons from the first end to the second distal end of the flexible elongate member.

2. The endoscope system in accordance with claim 1 wherein the one or more flexible tendons comprise one or more cable pairs wrapped in the wire coil sheath.

3. The endoscope system in accordance with claim 1 wherein the wire coil sheath comprises wire having a substantially square cross section wound around the corresponding one of the one or more flexible tendons.

4. The endoscope system in accordance with claim 1 wherein the substantially rectangular cross section of the wire coil sheath is shorter in a longitudinal direction of the wire coil sheath.

5. The endoscope system in accordance with any of the preceding claims, wherein the wire coil sheath comprises a super elastic material.

6. The endoscope system in accordance with claim 5 wherein the super elastic material is nitinol.

7. A flexible elongate member for use in an endoscopy system, the flexible elongate member having a first end for operational control and a second distal end for operation of robotic members at the second distal end, the flexible elongate member comprising:

one or more flexible tendons to provide operational control from the first end to the robotic members at the second distal end, wherein each of the one or more flexible tendons has a wire coil sheath, the wire coil sheath comprising wire having a substantially rectangular cross section wound around the corresponding one of the one or more flexible tendons,

wherein adjacent pitches of the wire contact each other, the substantially rectangular cross section having a cross-section area configured to allow stable contact between the adjacent pitches, and wherein the wire coil sheath extends along each of the one or more flexible tendons from the first end to the second distal end of the flexible elongate member.

8. The flexible elongate member in accordance with claim 7 wherein the one or more flexible tendons comprise one or more cable pairs wrapped in the wire coil sheath.

9. The flexible elongate member in accordance with claim 7 wherein the wire coil sheath comprises wire having a substantially square cross section wound around the corresponding one of the one or more flexible tendons.

10. The flexible elongate member in accordance with claim 7 wherein the substantially rectangular cross section of the wire coil sheath is shorter in a longitudinal direction of the wire coil sheath.

11. The flexible elongate member in accordance with any of claims 7 to 10 wherein the wire coil sheath comprises a super elastic material.

12. The flexible elongate member in accordance with claim 11 wherein the super elastic material is nitinol.