

Claims

What is claimed is:

1. A surgical arm assembly insertable into a cavity of a patient, the surgical arm assembly for use in performing an in vivo surgical action and comprising:
 - an end-effector assembly, the end-effector assembly having:
 - a first instrument assembly having:
 - a first instrument, the first instrument having a first elongated distal end for performing a surgical action, a second proximal end, and a disconnectable electric cable connected to the first instrument, the second proximal end of the first instrument having a first instrument contact portion, the first elongated distal end of the first instrument configurable to receive an electric current from an energy source via the disconnectable electric cable to perform an electrosurgical action when the disconnectable electric cable is configured to be connected to the energy source, the first elongated distal end of the first instrument configurable to not receive an electric current from the energy source via the disconnectable electric cable when the disconnectable electric cable is configured to be disconnected from the energy source;
 - a first instrument driven portion configurable to be driven in such a way as to move the first instrument relative to a first axis; and
 - a first instrument insulative portion providable between the first instrument and the first instrument driven portion, the first instrument insulative portion configurable to prevent at least the first instrument driven portion from receiving an electric current applied to the first instrument when the first instrument insulative portion is provided between the first instrument and the first instrument driven portion, the first instrument insulative portion including:

a first contact portion, the first contact portion of the first instrument insulative portion configured to contact with the first instrument contact portion;
and

a second contact portion, the second contact portion of the first instrument insulative portion configured to contact with the first instrument driven portion, the first instrument driven portion configured to move, via the first and second contact portions, the first elongated distal end of the first instrument relative to the first axis, wherein the first instrument insulative portion is provided between the first instrument and the first instrument driven portion in such a way that the first axis corresponds to a center axis of the first instrument insulative portion; and

an arm assembly securable to and unsecurable from the end-effector assembly, wherein the unsecuring of the end-effector assembly from the arm assembly includes configuring the disconnectable electric cable to be disconnected from the energy source.

2. The surgical arm assembly of claim 1, wherein the end-effector assembly further comprises a wrist assembly securable to the first instrument assembly, the wrist assembly having a wrist driven portion configurable to be driven in such a way as to move the first instrument relative to a second axis, the second axis being different from the first axis.

3. The surgical arm assembly of claim 2, further comprising an arm assembly secured to the wrist assembly, the arm assembly having:

a first instrument drive portion configurable to perform the driving of the first instrument driven portion; and

a wrist drive portion configurable to perform the driving of the wrist driven portion.

4. The surgical arm assembly of claim 3,

wherein the surgical arm assembly further comprises a second instrument assembly having:

a second instrument, the second instrument configurable to receive an electric current, the second instrument configurable to perform an electrosurgical action when an electric current is applied to the second instrument;

a second instrument driven portion configurable to be driven in such a way as to move the second instrument relative to the first axis; and

a second instrument insulative portion providable between the second instrument and the second instrument driven portion, the second instrument insulative portion configurable to prevent at least the second instrument driven portion from receiving an electric current applied to the second instrument when the second instrument insulative portion is provided between the second instrument and the second instrument driven portion;

wherein the wrist driven portion is configurable to be driven by the wrist drive portion in such a way as to move the second instrument relative to the second axis; and

wherein the arm assembly further comprises a second instrument drive portion configurable to perform the driving of the second instrument driven portion.

5. The surgical arm assembly of claim 4, wherein the first instrument and the second instrument are configurable to move independently from one another relative to the first axis.

6. The surgical arm assembly of claim 4, wherein the wrist driven portion is configurable to collectively move the first instrument and the second instrument relative to the second axis.

7. The surgical arm assembly of claim 2, wherein the first axis and the second axis are orthogonal to one another.

8. The surgical arm assembly of claim 4,

wherein the first instrument comprises an opening, the opening of the first instrument operable to house at least a portion of the first instrument insulative portion;

wherein the second instrument comprises an opening, the opening of the second instrument operable to house at least a portion of the second instrument insulative portion; and

wherein the first axis is formed through a center of the openings of the first instrument and the second instrument.

9. The surgical arm assembly of claim 4,

wherein the movement of the first instrument relative to the first axis includes a rotation of the first instrument relative to the first axis;

wherein the movement of the second instrument relative to the first axis includes a rotation of the second instrument relative to the first axis; and

wherein the movement of the first instrument and the second instrument relative to the second axis is a collective rotation of the first instrument and the second instrument relative to the second axis.

10. The surgical arm assembly of claim 4, wherein the first instrument is configurable to further receive a first electric current applied from an energy source so as to perform the actions of an electrosurgical instrument;

wherein when the first instrument receives the first electric current, the first instrument insulative portion is configurable to electrically isolate the first electric current received by the first instrument from passing through the end-effector assembly to the second instrument.

11. The surgical arm assembly of claim 4,

wherein the surgical arm assembly is in communication with a user interface;

wherein the surgical arm assembly is configurable to provide a haptic feedback response to the user interface when one or more of the following occur:

a movement of the first instrument and/or a movement of the second instrument encounter a resistance;

a driving of the first instrument by the first instrument driven portion and/or a driving of the second instrument by the second instrument driven portion encounter a resistance;

a driving of the first instrument driven portion by the first instrument drive portion and/or a driving of the second instrument driven portion by the second instrument drive portion encounter a resistance;

a driving of the first instrument by the wrist drive portion and/or a driving of the second instrument by the wrist drive portion encounter a resistance; and/or

a driving of the wrist driven portion by the wrist drive portion encounter a resistance.

12. A surgical arm assembly for use in performing an in vivo surgical action, the surgical arm assembly comprising:

an end-effector assembly, the end-effector assembly having:

a first instrument assembly having:

a first instrument, the first instrument having a first elongated distal end for performing a surgical action and a second proximal end, the second proximal end of the first instrument having an opening, the first instrument configurable to receive an electric current, the first instrument configurable to perform an electrosurgical action when an electric current is applied to the first instrument;

a first instrument driven portion configurable to be driven in such a way as to move the first instrument relative to a first axis; and

a first instrument insulative portion, the first instrument insulative portion provided in the opening of the first instrument, the first instrument insulative portion

configurable to move the first elongated distal end of the first instrument relative to the first axis when the first instrument driven portion drives the first instrument insulative portion to rotate around the first axis, the first axis being an axis drawn through a center of the opening of the first instrument and a center axis of the first instrument insulative portion, wherein the first instrument insulative portion is configurable to prevent at least the first instrument driven portion from receiving an electric current applied to the first instrument; and

a second instrument assembly having:

a second instrument, the second instrument having a first elongated distal end for performing a surgical action and a second proximal end, the second proximal end of the second instrument having an opening, the second instrument configurable to receive an electric current, the second instrument configurable to perform an electrosurgical action when an electric current is applied to the second instrument;

a second instrument driven portion configurable to be driven in such a way as to move the second instrument relative to the first axis; and

a second instrument insulative portion, the second instrument insulative portion provided in the opening of the second instrument, the second instrument insulative portion configurable to move the first elongated distal end of the second instrument relative to the first axis when the second instrument driven portion drives the second instrument insulative portion to rotate around the first axis, wherein the second instrument insulative portion is configurable to prevent at least the second instrument driven portion from receiving an electric current applied to the second instrument; and

an arm assembly securable to and unsecurable from the end effector assembly.

13. The surgical arm assembly of claim 12, wherein the first instrument and the second instrument are configurable to move independently from one another relative to the first axis,

and wherein the openings of the first and second instruments include a circular shaped opening for contacting with the first and second instrument insulative portions, respectively.

14. The surgical arm assembly of claim 12,

wherein the movement of the first elongated distal end of the first instrument relative to the first axis includes a rotation relative to the first axis; and

wherein the movement of the second elongated distal end of the second instrument relative to the first axis includes a rotation relative to the first axis.

15. The surgical arm assembly of claim 12, wherein the first and second instruments collectively form an electrosurgical instrument.