

CLAIMS

1. An instrument rotation mechanism for a surgical scoping device, the instrument rotation mechanism comprising:
- 5 a housing mountable at a proximal end of an instrument channel of a surgical scoping device;
- a proximal actuator mounted to rotate relative to the housing;
- 10 an elongate force transfer element configured to be slidably mounted within and to extend along the instrument channel of a surgical scoping device;
- a proximal coupler operably engaged with the proximal actuator and elongate force transfer element to transform rotational movement of the proximal actuator relative to the housing into linear movement of the elongate force transfer
- 15 element relative to the instrument channel;
- a distal end effector that is securable to a distal portion of a surgical instrument mounted in the instrument channel; and
- 20 a distal coupler operably engaged with the distal end effector and elongate force transfer element to transform linear movement of the elongate force transfer element relative to the instrument channel into
- 25 rotational movement of the distal end effector relative to the instrument channel.
2. An instrument rotation mechanism according to claim 1, wherein the proximal coupler is slidably mounted in the housing.
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3. An instrument rotation mechanism according to claim 1 or 2, wherein the housing includes a rotation constraining element arranged to prevent the elongate force transfer
- 35 element from rotating relative to the housing.

4. An instrument rotation mechanism according to claim 3, wherein the rotation constraining element is arranged to engage the proximal coupler to prevent it from rotating relative to the housing.

5. An instrument rotation mechanism according to claim 4, wherein the rotation constraining element defines a linear sliding track for the proximal coupler.

6. An instrument rotation mechanism according to any preceding claim, wherein the proximal coupler and proximal actuator are operably connected via a non-locking thread-type engagement.

7. An instrument rotation mechanism according to any preceding claim, wherein the proximal actuator comprises a helical formation and the proximal coupler comprises an engagement element mounted on and movable along the helical formation.

8. An instrument rotation mechanism according to claim 7, wherein the helical formation is a recessed track and the engagement element is a pin that sits in the recessed track.

9. An instrument rotation mechanism according to any preceding claim, wherein the distal coupler and distal end effector are operably connected via a non-locking thread-type engagement.

10. An instrument rotation mechanism according to any preceding claim, wherein the distal end effector comprises a helical formation and the distal coupler comprises an engagement element mounted on and movable along the helical formation.

11. An instrument rotation mechanism according to claim 10, wherein the helical formation is a helical sleeve mounted around the distal portion of the surgical instrument, and the engagement element comprises a ring having a helical portion that cooperate with the helical sleeve.

12. An instrument rotation mechanism according to any preceding claim, wherein:

the proximal actuator comprises a first helical formation and the proximal coupler comprises a first engagement element mounted on and movable along the first helical formation,

the distal end effector comprises a second helical formation and the distal coupler comprises a second engagement element mounted on and movable along the second helical formation, and

a pitch of the first helical formation is greater than a pitch of the second helical formation.

13. An instrument rotation mechanism according to claim 12, wherein the pitch of the first helical formation is equal to or greater than 1.5 times the pitch of the second helical formation.

14. An instrument rotation mechanism according to any preceding claim comprising an instrument cable that extends through the instrument channel for connection to the surgical instrument, wherein the proximal actuator is secured to a proximal portion of the instrument cable.

15. An instrument rotation mechanism according to claim 14, wherein the distal end effector is secured to a distal portion of the instrument cable.

16. An instrument rotation mechanism according to any preceding claim wherein the elongate force transfer element comprise a proximal portion and a distal portion, and wherein the instrument rotation mechanism further comprises

5 an intermediate rotatable member located between the proximal portion and distal portion of the elongate force transfer element,

a proximal intermediate coupler operably engaged with the intermediate rotatable member and the proximal portion of the elongate force transfer element to transform linear movement
10 of the proximal portion of the elongate force transfer element relative to the instrument channel into rotational movement of the intermediate rotatable member relative to the instrument channel, and

15 a distal intermediate coupler operably engaged with the intermediate rotatable member and the distal portion of the elongate force transfer element to transform rotational movement of the intermediate rotatable member relative to the instrument channel into linear movement of the distal portion
20 of the elongate force transfer element relative to the instrument channel.

17. An instrument rotation mechanism according to claim 16, wherein the intermediate rotatable member comprises a
25 helical sleeve and the proximal intermediate coupler and the distal intermediate coupler each comprise a ring having a helical cut-out section configured to cooperate with the helical sleeve.

30 18. An instrument rotation mechanism according to any preceding claim, wherein the housing is part of a handle for operating the surgical scoping device.

19. An instrument rotation mechanism according to any
35 preceding claim, wherein the elongate force transfer element

comprises a sleeve having a longitudinal passage therethrough for conveying an instrument cable along the instrument channel.

5 20. An instrument rotation mechanism according to claim 19, wherein the sleeve is porous at its distal end to facilitate fluid flow through the instrument channel.

10 21. An instrument rotation mechanism according to claim 20, wherein the sleeve comprises a plurality of holes at its distal end.

15 22. An instrument rotation mechanism according to any preceding claim, wherein the elongate force transfer element is any of:

 a plastic extruded catheter,
 a laser cut tube,
 a tube formed of encapsulated braiding.

20 23. An instrument rotation mechanism according to any preceding claim, wherein elongate force transfer element is manufactured from PEEK, polyimide, or stainless steel.