

WHAT IS CLAIMED IS:

1. A medical device comprising: a catheter adapter subassembly and a wire subassembly including a wire, wherein one of the catheter adapter subassembly and the wire subassembly
5 includes a permanent magnet element, and the other of the catheter adapter subassembly and the wire subassembly includes a magnetizable feature to permit measurement of relative motion of the wire subassembly and the catheter adapter subassembly.
2. The medical device of claim 1, wherein the wire subassembly comprises a guidewire.
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3. The medical device of claim 1, wherein the wire subassembly comprises a stylet.
4. The medical device according to claim 1, wherein the wire subassembly includes the magnetizable feature and the catheter adapter subassembly includes the permanent magnet
15 element, and the magnetizable feature of the wire subassembly is selected from the group consisting of an adhesive, the wire, a notch in the wire, a ferrule on the wire, and a spot weld on the wire.
5. The medical device according to claim 1, wherein the catheter adapter subassembly
20 includes the permanent magnet element and the wire subassembly includes the magnetizable feature and the magnetizable feature is a magnetizable wire.
6. The medical device according to claim 1, wherein the wire subassembly includes the magnetizable feature, and the catheter adapter subassembly includes a catheter adapter body, catheter tubing and the permanent magnet element, wherein the permanent magnet element is
25 selected from the group consisting of a metal mandrel for connecting catheter tubing to the catheter adapter body , a catheter tubing adhesive, a blood control component of the catheter adapter subassembly, and a magnetic wedge on the catheter adapter body.
7. The medical device according to claim 1, wherein the wire subassembly includes the permanent magnet element, and the catheter adapter subassembly includes the magnetizable feature, wherein the magnetizable feature includes magnetizable catheter tubing.
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8. A guidewire introducer assembly comprising: a guidewire introducer subassembly having at least one end and a guidewire extending from the at least one end of the guidewire introducer, wherein one of the guidewire introducer subassembly and the guidewire includes a permanent magnet element, and the other of the guidewire introducer subassembly and the
5 guidewire includes a magnetizable feature.

9. The guidewire introducer assembly according to claim 8, wherein the guidewire includes the magnetizable feature and the guidewire introducer subassembly includes the permanent magnet element, and the magnetizable feature of the guidewire is selected from the
10 group consisting of a needle adhesive, a needle, a needle safety element, a notch, a needle ferrule, and a spot weld.

10. A system for determining relative position of a catheter adapter subassembly and wire subassembly comprising:
15 a catheter having a catheter distal tip and a wire having a wire distal tip;
a permanent magnet element associated with one of the catheter adapter subassembly and wire subassembly;
a magnetizable feature associated with the other of the catheter adapter subassembly and the wire subassembly; and
20 magnetometers positioned with respect to the catheter adapter subassembly and the wire subassembly, the magnetometers configured to determine relative movement of the catheter adapter subassembly and wire subassembly.

11. The system of claim 10, wherein the permanent magnet or the magnetizable feature on
25 a fixed location on the catheter adapter subassembly or wire subassembly provides a measurement datum to determine movement of the magnetizable feature and permanent magnet.

12. The system of claim 10, wherein the permanent magnet is on the wire subassembly and
30 the magnetizable feature is on the catheter adapter subassembly.

13. The system of claim 10 wherein the permanent magnet is on the catheter adapter subassembly and the magnetizable feature is on the wire subassembly.

14. The system of claim 10, wherein the magnetometers include three different magnetometers arranged in a three-dimensional grid array as part of an ultrasound system which can derive a three-dimensional correlation to obtain a distance from the grid array to the magnetizable feature or permanent magnet.

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15. The system of claim 14, wherein the three-dimensional correlation is determined by a function $I = f(B_i \mu_r)$, where $i = x$ or y or z along three axes, x , y and z are distances in three planes, B is a known magnetic field produced by the permanent magnet or magnetizable feature, and μ_r is magnetic permeability.

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16. The system of claim 14, wherein the correlation provides a distance in three planes to determine location of the catheter distal tip.

17. The system of claim 14, wherein the correlation provides a distance in three planes to determine location of the wire distal tip.

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18. The system of claim 10, wherein the wire subassembly comprises a guidewire or a stylet.

20 19. A method for determining a relative position of a catheter tip and a wire tip, the method comprising:

providing a catheter adapter subassembly including catheter and a wire subassembly including a wire, the catheter having a catheter distal tip and the wire having a wire distal tip;

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associating a permanent magnet element with one of the catheter and the wire;

associating a magnetizable feature with the other of the catheter and the wire;

obtaining a measured position of the permanent magnet;

obtaining a measured position of the magnetizable feature to obtain a calculated position of the catheter distal tip and a calculated position of the wire distal tip; and

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comparing the calculated position of the catheter distal tip with the calculated position of the wire distal tip to determine the relative position of the catheter distal tip and the wire distal tip.

20. The method of claim 19, wherein the wire includes the magnetizable feature and the catheter includes the permanent magnet and the relative position of the catheter distal tip and the wire distal tip indicates that the catheter is properly seated on the wire.
- 5 21. The method of claim 19, wherein the catheter adapter subassembly includes the magnetizable feature and the wire subassembly includes the permanent magnet, and relative movement of the catheter adapter subassembly and wire subassembly is determined by a three-dimensional array of magnetometers positioned in proximity to at least one of the permanent magnet the magnetizable feature.
- 10 22. The method of claim 21, further comprising magnetizing the magnetizable feature by applying an external magnetic field to the magnetizable feature.
23. The method of claim 21, wherein the three-dimensional array of magnetometers is part
15 of an ultrasound system, and the ultrasound system derives a three-dimensional correlation to obtain a distance from the array of magnetometers to the magnetizable feature or permanent magnet.
24. The method of claim 23, wherein the three-dimensional correlation is determined by
20 the function $I = f(B_i \mu_r)$, where $i = x$ or y or z along three axes, x , y and z are distances in three planes, B is a known magnetic field produced by the permanent magnet or magnetizable feature, and μ_r is magnetic permeability.
25. The method of claim 19, wherein the catheter adapter subassembly includes the
25 permanent magnet and the wire subassembly includes the magnetizable feature, and relative movement of the catheter adapter subassembly and wire subassembly is determined by a three-dimensional array of magnetometers positioned in proximity to at least one of the permanent magnet the magnetizable feature.
- 30 26. The method of claim 25, further comprising magnetizing the magnetizable feature by applying an external magnetic field to the magnetizable feature.
27. The method of claim 25, wherein the three-dimensional array of magnetometers is part of an ultrasound system, and the ultrasound system derives a three-dimensional correlation to

obtain a distance from the array of magnetometers to the magnetizable feature or permanent magnet.

28. The method of claim 27, wherein the three-dimensional correlation is determined by
5 the function $I = f(B_i \mu_r)$, where $i = x$ or y or z along three axes, x , y and z are distances in three planes, B is a known magnetic field produced by the permanent magnet or magnetizable feature, and μ_r is magnetic permeability.

29. The method of claim 19, wherein the wire subassembly comprises a guidewire or a
10 stylet.