

CLAIMS

1. A catheter assembly comprising:
a catheter;
a needle having a sharp distal tip disposed within the catheter;
a catheter hub connected to the catheter having the needle passing therethrough, the catheter hub including:
a valve that selectively permits or blocks a flow of fluid through the catheter;
a valve actuator that moves between a first position and a second position to actuate the valve, the valve actuator including a central flow passage and one or more external grooves or side openings to promote flushing; and
a return member that returns the valve actuator from the second position to the first position; and
a needle protection member that encloses the sharp distal tip of the needle.
2. The catheter assembly of claim 1, wherein the return member comprises a biasing member.
3. The catheter assembly of claim 2, wherein the biasing member comprises a spring.
4. The catheter assembly of claim 2, wherein the biasing member comprises an elastomeric member.
5. The catheter assembly of claim 3, wherein the spring supports the valve actuator so that the valve actuator is held in the catheter hub and does not contact an inner wall of the catheter hub.

6. The catheter assembly of claim 1, wherein the needle protection member encloses the needle completely.
7. The catheter assembly of claim 1, wherein the needle protection member includes a spring to retract the needle.
8. The catheter assembly of claim 1, wherein the needle protection member encloses only a sharp distal tip area of the needle.
9. The catheter assembly of claim 8, wherein:
the needle further includes a deformation, and
the needle protection member interacts with the deformation.
10. The catheter assembly of claim 1, wherein the needle protection member includes a resilient clip.
11. The catheter assembly of claim 10, wherein the needle biases the resilient clip into an open position during needle use.
12. The catheter assembly of claim 10, wherein the resilient clip moves to a closed position to block the distal tip of the needle when the needle is retracted after use.
13. The catheter assembly of claim 12, wherein when the resilient clip is in the closed position, the resilient clip prevents the distal tip of the needle from exiting the resilient clip.

14. The catheter assembly of claim 12, wherein the resilient clip further includes at least one barrier that blocks the needle in the closed position.
15. The catheter assembly of claim 1, wherein the valve comprises a septum.
16. The catheter assembly of claim 15, wherein the valve actuator moves between the first position that is adjacent to the septum and the second position that opens one or more pre-formed slits in the septum.
17. The catheter assembly of claim 1, wherein the return member being resilient flaps of the valve.
18. A catheter assembly comprising:
a catheter; and
a catheter hub connected to the catheter, the catheter hub including:
a valve that selectively permits or blocks a flow of fluid through the catheter;
a valve actuator that moves between a first position and a second position, the valve actuator including one or more external grooves that extend axially along a distal portion of the valve actuator; and
a return member that returns the valve actuator from the second position to the first position.
19. The catheter assembly of claim 18, wherein the valve actuator further includes one or more openings that extends through the valve actuator.
20. The catheter assembly of claim 18, wherein in the second position, the valve actuator and the one or more grooves of the valve actuator penetrate the valve.

21. The catheter assembly of claim 18, wherein the valve comprises a septum.
22. The catheter assembly of claim 21, wherein the valve actuator moves between the first position that is adjacent to the septum and the second position that penetrates one or more pre-formed slits in the septum.
23. A method of operating a catheter assembly comprising:
disposing a needle having a sharp distal tip within a catheter in a position configured to receive fluid;
removing the needle while maintaining fluid flow through the catheter;
enclosing at least the sharp distal tip of the needle by a needle protection member;
opening a valve with a valve actuator that moves from a first position to a second position to establish fluid communication between the catheter and a catheter hub, the valve actuator including a central flow passage and one or more external grooves or side openings;
directing fluid through the central flow passage and through the one or more external grooves or the side openings of the valve actuator; and
returning the valve actuator from the second position to the first position to close the valve.
24. The method of operating the catheter assembly of claim 23, further comprising
biasing the needle protection member by the needle into an open position during use;
and
moving the needle protection member to block the distal tip of the needle when the

needle is retracted after use, wherein

the needle protection member comprises a resilient clip.

25. The method of operating the catheter assembly of claim 23, further comprising penetrating the valve by moving the valve actuator from the first position to the second position and through the valve.
26. The catheter assembly of claim 23, wherein the valve comprises a septum.
27. The catheter assembly of claim 26, wherein the valve actuator moves between the first position that is adjacent to the septum and the second position that opens one or more pre-formed slits in the septum.
28. A catheter assembly comprising:
 - a catheter;
 - a needle having a sharp distal tip disposed within the catheter;
 - a catheter hub connected to the catheter having the needle passing therethrough, the catheter hub including:
 - a valve that selectively permits or blocks a flow of fluid through the catheter;
 - a valve actuator that moves between a first position and a second position; and
 - a spring that returns the valve actuator from the second position to the first position;
 - wherein the valve actuator is supported only by the spring so that the valve actuator is held in the catheter hub and does not contact an inner wall of the catheter hub.

29. The catheter assembly of claim 28, wherein the spring is a coil spring that surrounds the valve actuator.
30. The catheter assembly of claim 28, wherein
the spring includes an outer diameter;
the catheter hub includes an inner surface; and
the outer diameter of the spring and the inner surface of the catheter hub are engaged via an interference fit.
31. The catheter assembly of claim 28, wherein
the spring includes an inner diameter;
the valve actuator includes an outer surface; and
the inner diameter of the spring and the outer surface of the valve actuator are engaged via an interference fit.