

CLAIMS

1. A catheter assembly comprising:
 - a catheter;
 - a needle having a distal tip and 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, one or more external grooves that extend axially from a distal end of the valve actuator, and one or more 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 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 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 comprises 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 a central flow passage, one or more side openings that extend through the actuator in a direction perpendicular to a centerline of the actuator, and one or more external grooves that extend axially along a distal portion of the valve actuator, the one or more external grooves not being in direct fluid communication with the central flow passage.
19. The catheter assembly of claim 18, wherein in the second position, the valve actuator and the one or more grooves of the valve actuator open the valve.
20. The catheter assembly of claim 18, wherein the valve comprises a septum.
21. The catheter assembly of claim 20, wherein the valve actuator moves between the first position that is adjacent to the septum and the second position that open one or more pre-formed slits in the septum.
22. A catheter assembly comprising:
 - a catheter;
 - a needle having a distal tip and 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, one or more side openings, and one or more external grooves that (1) extend axially along a distal portion of an outer surface of the valve actuator in a direction parallel to the centerline of the actuator to promote flushing and (2) do not extend into the central flow passage; and

a spring that returns the valve actuator from the second position to the first position;

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.

23. The catheter assembly of claim 22, wherein the spring comprises a coil spring that surrounds the valve actuator.
24. The catheter assembly of claim 22, 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.
25. The catheter assembly of claim 22, 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.