CLAIMS

What is claimed is:

1. A cage-mounted valve assembly for delivering a fluid from a water source to a cage in an animal caging system for housing one or more animals, the cage-mounted valve assembly comprising:

a valve body defining a first portion of a fluid channel, the valve body having a bottom surface;

an end cap defining a second portion of the fluid channel, wherein the end cap has a proximal end with an opening for delivery of water to the one or more animals housed in the cage and a distal end designed and constructed to be joined with the valve body to facilitate the delivery of water through the fluid channel;

an interior stem displaceable between an open position and a closed position, the interior stem disposed at least in part in the fluid channel,

wherein the interior stem has

a distal end having a top surface and a bottom surface; and

an exposed end proximate the opening of the end cap, wherein the exposed end may be displaced by the one or more animals to cause the interior stem to be displaced to the open position or the closed position;

a spring element disposed in the fluid channel, wherein the spring element has a proximal end that abuts the top surface of the distal end of the interior stem and the spring element is capable of applying a biasing force to the interior stem; and

a sealing member disposed in the fluid channel, wherein

the sealing member is in abutment with the bottom surface of the distal end of the interior stem to prevent fluid from flowing through the opening in the end cap when the interior stem is in the closed position.

2. The cage-mounted valve assembly of claim 1 wherein:

the end cap includes at least one internal shoulder disposed within the proximal end of the end cap;

the interior stem includes a lower portion having a lower surface disposed in the fluid channel, wherein:

the lower surface is designed and constructed to abut the at least one internal shoulder of the end cap when the internal stem is in the closed position; and

the lower surface is designed and construed to provide a non-linear pathway through the fluid channel when the internal stem is in the open position to prevent jamming of the valve assembly.

3. The cage-mounted valve assembly of claim 1 wherein the valve body, the end cap, and at least a portion of the interior stem are injection molded.

4. The cage-mounted valve assembly of claim 1 wherein the valve body, the end cap, and at least a portion of the interior stem are constructed of a plastic material.

5. The cage-mounted valve assembly of claim 1 wherein the valve body, the end cap, and at least a portion of the interior stem are constructed of a material that can withstand a temperature up to at least 270 degrees Fahrenheit.

6. The cage-mounted valve assembly of claim 1 wherein the valve body, the end cap, and at least a portion of the interior stem are constructed of a material that has chemical resistance properties.

7. The cage-mounted valve assembly of claim 1 further including a valve shield designed and constructed to fit over at least the end cap of the valve assembly to prevent the animals in the cage from chewing the end cap.

8. The cage-mounted valve assembly of claim 1 further including a valve shield designed and constructed to fit over at least an animal-accessible portion of the valve assembly that is exposed to the animals in the cage to prevent the animals in the cage from chewing the animal-accessible portion of the valve assembly.

9. The cage-mounted valve assembly of claim 7 wherein the valve shield is made of a metallic material.

10. The cage-mounted valve assembly of claim 8 wherein the valve shield is made of a metallic material.

11. The cage-mounted valve assembly of claim 1 wherein the exposed end of the interior stem is constructed of a material that is animal chew resistant.

12. The cage-mounted valve assembly of claim 1 wherein the exposed end of the interior stem is constructed of a metallic material.

13. A cage-mounted fluid delivery system for delivering a fluid from a water source to a cage for housing one or more animals, wherein the cage includes a grommet for facilitating docking the cage in high density animal housing racks, the system comprising:

a fluid delivery valve assembly comprising:

a valve member defining a fluid channel, the member having a proximal end with an opening and a distal end adapted to cooperate with the water source to deliver water from the water source through the fluid channel and through the opening to the cage;

a stem member disposed at least in part within the fluid channel, the stem member having a distal end with a top surface and a bottom surface and a proximal end having an actuation portion proximate the opening of the valve member, wherein the actuation portion is selectively displaceable to toggle the stem member into an open position and a closed position;

a spring element disposed within said fluid channel, wherein a portion of said spring element interacts with said stem member to apply a biasing force to said stem member;

a sealing member disposed in the fluid channel, wherein the sealing member is in abutment with the bottom surface of the distal end of the stem member to prevent

fluid from flowing through the fluid channel when the stem member is in the closed position; and

a valve stem, the valve stem being selectively engagable with the fluid delivery valve assembly to mount the fluid delivery valve assembly in the cage substantially proximate the position of the grommet.

14. The cage-mounted fluid delivery system of claim 13 wherein the valve stem includes a peripheral flange member designed and construed to create a torturous path for air flow into the cage to prevent non-sterile air from entering the cage and to ensure a uniform flow of air into the cage.

15. The cage-mounted fluid delivery system of claim 13 wherein the valve stem is injection molded.

16. The cage-mounted fluid delivery system of claim 14 wherein the peripheral flange member is integrally formed as part of the valve stem.

17. A fluid delivery system for delivering a fluid from a water source to a cage for housing one or more animals, the system comprising:

a fluid channel flowing from the water source to the cage;

a fluid delivery valve assembly defining a first portion of the fluid channel;

a valve stem defining a second portion of the fluid channel, the valve stem being selectively engagable with the fluid delivery valve assembly to mount the fluid delivery valve assembly in the cage, wherein the valve stem includes an elongated portion;

a water supply manifold having at least one aperture, the water supply manifold defining a third portion of the fluid channel;

a quick disconnect element defining a fourth portion of the fluid channel to facilitate the flow of fluid from the water supply manifold through the valve stem to the fluid delivery valve assembly, wherein

the quick disconnect element is selectively engagable with the elongated portion of the valve stem to connect the second portion of the fluid channel with the fourth portion of the fluid channel;

the quick disconnect element has an open position that permits the flow of fluid from the water supply manifold therethrough and a closed position that prohibits the flow of fluid from the water supply manifold therethrough, the quick disconnect element including:

a body;

a cap having an opening, the cap designed and constructed to be joined with the body;

a sealing element disposed between the body and the cap and within the fourth portion of the fluid channel proximate the cap;

a plunger disposed between the sealing element and the body within the fourth portion of the fluid channel;

a spring element disposed between the plunger and the body within the forth portion of the fluid channel, wherein

the spring element is capable of applying a biasing force to the plunger to push the plunger toward the cap to cause the plunger to abut the sealing element when the quick disconnect element is in the closed position; and

the spring element is capable of retracting to place the quick disconnect element into the open position when the elongated portion of the valve stem displaces the plunger to allow the plunger to move toward the body to permit fluid to flow through the fourth portion of the fluid channel.

18. The fluid delivery system of claim 17 further comprising a saddle fitting defining a fifth portion of the fluid channel, the saddle fitting designed and constructed to

connect the quick disconnect element to the water supply manifold to permit the fluid to flow from the water supply manifold to the quick disconnect element, the saddle fitting comprising:

a U-shaped portion designed and constructed to fit over at least a portion of the water supply manifold; and

an attachment portion extending outward from the U-shaped portion, the attachment portion designed and constructed to be selectively coupled to the quick disconnect element, the attachment portion including

a protrusion extending inward from the U-shaped portion, the protrusion being sized and configured to fit into the at least one aperture in the water supply manifold to connect the fifth portion of the fluid channel to the third portion of the fluid channel.

19. The fluid delivery system of claim 17:

wherein at least two saddle fittings are provided, wherein the U-shaped portions of the saddle fittings are capable of fitting around a circumference of the water supply manifold; and

further comprising at least two locking rings, which are capable of locking the saddle fittings to the water supply manifold.

CLAIMS

What is claimed is:

1. A cage-mountable valve assembly for delivering a fluid from a water source to a cage in an animal caging system for housing one or more animals, the cage-mountable valve assembly comprising:

a valve body; and

an end cap,

the valve body and the end cap joined together to define distal and proximal portions, respectively, of a fluid channel through the valve assembly,

the valve body having a lower surface and a lower peripheral flange disposed within the fluid channel, and

the end cap having an interior shoulder, a lower shoulder, and a tapered proximal end with a jam-preventing opening;

a first sealing element;

a second sealing element;

a spring element; and

an interior stem,

the sealing elements, the spring element, and the interior stem disposed within the valve body and the end cap and in the fluid channel to open and close the valve assembly,

the interior stem selectively displaceable by an animal from a closed position to an open position, and having an enlarged top portion with a top surface and a bottom surface, a lower portion with a lower surface, and an exposed portion with a circumference smaller than that of the lower portion, the exposed portion extending beyond the lower portion and disposed

in and externally accessible through the jam-preventing opening of the end cap, wherein the exposed portion may be displaced by an animal to cause the interior stem to move toward the valve body and away from the second sealing element to an open position, allowing fluid to flow through the fluid channel and out of the jam-preventing opening to the animal,

the spring element having a distal end that abuts the lower surface of the valve body and a proximal end that abuts the top surface of the top portion of the interior stem,

the first sealing element positioned under the lower peripheral flange of the valve body, within the end cap, proximate the junction between the end cap and the valve body, and

the second sealing element positioned under the top portion of the interior stem, wherein the spring element is configured to apply a biasing force toward the jam-preventing opening to cause the bottom surface of the top portion of the interior stem to abut against the second sealing element, which abuts against the interior shoulder of the end cap to prevent fluid from flowing out of the jam-preventing opening when the interior stem is in a closed position,

wherein the lower surface of the lower portion of the interior stem abuts the lower shoulder of the end cap proximate the jam-preventing opening, so that a direct path is not available into the valve whether the interior stem is in an open or a closed position.

2. The cage-mountable valve assembly of claim 1, wherein the valve body and the end cap are joined together by sonic welding.

3. The cage-mountable valve assembly of claim 1, wherein at least one of the valve body and the end cap are injection molded.

4. The cage-mountable valve assembly of claim 1, wherein at least one of the valve body and the end cap are constructed of a plastic material.

5. The cage-mountable valve assembly of claim 1, wherein the valve assembly is constructed of materials that can withstand a temperature up to at least 270 degrees Fahrenheit.

6. The cage-mountable valve assembly of claim 1, wherein the valve assembly is constructed of materials that have chemical resistance properties.

7. The cage-mountable valve assembly of claim 1, further including a valve shield configured to fit over at least the end cap of the valve assembly to prevent the animals in the cage from chewing the end cap.

8. The cage-mountable valve assembly of claim 1, further including a valve shield configured to fit over at least an animal-accessible portion of the valve assembly that is exposed to the animals in the cage to prevent the animals in the cage from chewing the animal-accessible portion of the valve assembly.

9. The cage-mountable valve assembly of claim 7, wherein the valve shield is made of a metallic material.

10. The cage-mountable valve assembly of claim 8, wherein the valve shield is made of a metallic material.

11. The cage-mountable valve assembly of claim 1, wherein the exposed portion of the interior stem is constructed of a material that is animal chew resistant.

12. The cage-mountable valve assembly of claim 1, wherein the exposed portion of the interior stem is constructed of a metallic material.

13. A cage-mountable fluid delivery system comprising:

(i) the valve assembly of claim 1; and

(ii) a valve stem having a fluid channel therethrough, the valve stem selectively engageable with the valve assembly to mount the valve assembly in the interior of the cage

adjacent to a grommet positioned in a sidewall of the cage, wherein the valve stem is positioned on the exterior of the cage proximate the grommet and includes an elongated portion and a peripheral flange configured to create a tortuous path for air flow into the cage to prevent non-sterile air from entering the cage and to ensure a uniform flow of air into the cage.

14. The cage-mountable fluid delivery system of claim 13, wherein the valve stem is injection molded.

15. The cage-mountable fluid delivery system of claim 13, wherein the valve body of the valve assembly and the valve stem include screw threads to screw the valve assembly and the valve stem together to mount the valve assembly to the sidewall of the cage at the position of the grommet.

16. The cage-mountable fluid delivery system of claim 13, further comprising:

(iii) a quick disconnect (QD) element defining a fluid channel therethrough, the QD element selectively engageable with the elongated portion of the valve stem to facilitate the flow of fluid from a water supply manifold through the valve stem to the valve assembly, the QD element including:

a QD body including a shoulder having a bottom surface;

a QD cap having an opening, the QD cap configured to be joined with the QD body to define the fluid channel through the QD element;

a QD sealing element;

a QD plunger having an internal end and an exposed end; and

a QD spring element,

the QD sealing element, the QD plunger, and the QD spring element disposed within the QD body and the QD cap and in the fluid channel through the QD element to to open and close the QD element, and

the QD spring element having a distal end that abuts the bottom surface of the shoulder of the QD body and a proximal end that abuts the internal end of the QD plunger,

wherein the QD spring element is capable of applying a biasing force to the QD plunger to push the QD plunger toward the QD cap to cause the QD plunger to abut the QD sealing element when the QD element is in a closed position; and

wherein the QD spring element is capable of retracting to place the QD element in an open position when the elongated portion of the valve stem enters the opening of the QD cap and pushes against the exposed end of the QD plunger to cause the QD plunger to move toward the QD body and away from the QD sealing element to permit fluid to flow through the QD element; and

(iv) a saddle fitting configured to connect the QD element to the water supply manifold, the saddle fitting comprising:

a U-shaped portion configured to fit over at least a portion of the water supply manifold, the U-shaped portion including at least one grip rib extending inward from the U-shaped portion; and

an attachment portion extending outward from the U-shaped portion, the attachment portion configured to be selectively coupled to the QD element, the attachment portion including a protrusion extending inward from the U-shaped portion, the protrusion being sized and configured to fit into an aperture in the water supply manifold.

17. The cage-mountable fluid delivery system of claim 15:

wherein at least two saddle fittings are provided, wherein the U-shaped portions of the saddle fittings are capable of fitting around a circumference of the water supply manifold; and

further comprising at least two locking rings, which are capable of locking the saddle fittings to the water supply manifold.

18. The cage-mountable valve assembly of claim 1, wherein the end cap comprises injection molded plastic having one or more ribs on its outer surface to facilitate dimensional stability.

19. The cage-mountable fluid delivery system of claim 15 wherein the U-shaped portion of the saddle fitting includes at least one sealing rib extending inward from the U-shaped portion to seal the saddle fitting to a portion of the water supply manifold.

20. The cage-mountable fluid delivery system of claim 15, wherein the U-shaped portion of the saddle fitting includes at least one grip rib extending inward from the U-shaped portion along the curve to facilitate gripping the saddle fitting to a portion of the water supply manifold and to prevent movement of the saddle fitting from stretching or deforming the water supply manifold.

21. The cage-mountable fluid delivery system of claim 13, further comprising at least one of a first alignment element positioned between the valve assembly and the grommet, and a second alignment element positioned between the grommet and the valve stem.

22. The cage-mountable fluid delivery system of claim 15, wherein the QD body and the QD cap are joined together by sonic welding.

23. The cage-mountable fluid delivery system of claim 15, wherein the QD body and the attachment portion of the saddle fitting include screw threads to screw the QD body and the saddle fitting together.

24. The cage-mountable fluid delivery system of claim 15, further comprising a third sealing element positioned between the QD body and the saddle fitting.

25. The cage-mountable valve assembly of claim 1, wherein the jam-preventing opening includes angular surfaces which taper inward from the jam-preventing opening toward the exposed portion of the interior stem to facilitate animal access to the exposed portion of the interior stem.