A filler neck closure system includes a capless fuel tank filler neck and a closure. The closure is coupled to the capless fuel tank filler neck to close an opening into the fuel tank filler neck.
LOCKABLE PLUG FOR CAPLESS FUEL TANK FILLER NECK

[0001] This application claims priority under 35 U.S.C. §119(e) to U.S. Provisional Application Ser. No. 60/743, 580, filed Mar. 20, 2006, which is expressly incorporated by reference herein.

BACKGROUND

[0002] The present disclosure relates to fuel tank filler necks, and in particular, to closures for capless fuel tank filler necks. More particularly, the present disclosure relates to locks for fuel tank filler neck closure systems.

SUMMARY

[0003] A capless filler neck barricade in accordance with the present disclosure includes a capless fuel tank filler neck and a lockable plug. The lockable plug is configured to close a top aperture opening into a fuel-dispensing pump nozzle-receiving passageway formed in the capless fuel tank filler neck to block access to a fuel tank through the capless fuel tank filler neck.

[0004] In illustrative embodiments, the lockable plug comprises a barrier and a barrier lock. The barrier is arranged to occlude the top opening formed in the nozzle-receiving passageway of the capless fuel tank filler neck. The barrier lock includes a movable plug retainer and a retainer controller coupled to the plug retainer. The barrier includes a cover plate and a lock housing. The lock housing depends from the cover plate and contains the plug retainer and the retainer controller included in the barrier lock.

[0005] In an illustrative embodiment, the retainer controller included in the barrier lock is operated by means of a key to move the plug retainer relative to the lock housing between retracted and extended positions. Movement of the plug retainer to the extended position "locks" the lockable plug and to the retracted position "unlocks" the lockable plug.

[0006] In use, the lockable plug can be inserted into a top opening of a capless fuel tank filler neck and the plug retainer moved to the extended position while the cover plate is at rest on a top wall of the filler neck and the lock housing is arranged to extend through the top aperture opening into the nozzle-receiving passageway to anchor the lockable plug temporarily in the top aperture provided in the filler neck. In this anchored position, the lockable plug occludes the top aperture and blocks unauthorized entry of a fuel-dispensing pump nozzle or a siphon tube into the capless fuel tank filler neck through the top aperture provided in the filler neck.

[0007] In preparation for tank refueling, an authorized user moves the plug retainer relative to the lock housing to the retracted position using the key to unlock the lockable plug. The user then removes the lockable plug from the filler neck to “open” the nozzle-receiving passageway.

[0008] Additional features of the disclosure will become apparent to those skilled in the art upon consideration of the following detailed description of illustrative embodiments exemplifying the best mode of carrying out the disclosure as presently perceived.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The detailed description particularly refers to the accompanying figures in which:

[0010] FIG. 1 is an exploded assembly view of a capless fuel tank filler neck system in accordance with the present disclosure showing a fill pipe closure unit adapted to be mounted in a passageway formed in an underlying fill pipe to provide a capless fuel tank filler neck, a lockable plug arranged to overlie the fill pipe closure unit and fit inside a top aperture formed in the fill pipe closure unit and closed normally by a movable appearance door, and a key for locking and unlocking the lockable plug;

[0011] FIG. 2 is an enlarged sectional view of an upper portion of the fill pipe closure unit of FIG. 1 suggesting downward movement of the lockable plug into the top aperture formed in the fill pipe closure unit to (1) push the appearance door to a withdrawn position away from the top aperture and (2) close the top aperture and showing that a round cover plate included in the lockable plug rests on a top wall of the fill pipe closure unit to support a lock housing also included in the lockable plug in a stationary position in the top opening while the lockable plug remains “unlocked”;

[0012] FIG. 3 is a view similar to FIG. 2 showing rotation of the key in a key slot provided in the lockable plug about a vertical axis to move retention arms included in the lockable plug relative to the lock housing to engage a downwardly facing surface of a retention rim included in the fill pipe closure unit so as to anchor the lockable plug in a fixed position in the top aperture formed in the fill pipe closure unit by “trapping” the retention rim between the overlying cover plate and the underlying extended retention arms included in the lockable plug.

DETAILED DESCRIPTION

[0013] A lockable plug 10 and a capless fuel tank filler neck 11 shown, for example, in FIG. 1 cooperate to form a capless filler neck barricade 100 as suggested, for example, in FIGS. 2 and 3. Lockable plug 10 is inserted into a fill pipe closure unit 12 adapted to be mounted in an underlying fill pipe 14 coupled to a fuel tank 15 to close a top aperture 16 formed in fill pipe closure unit 12 as suggested, for example, in FIGS. 1-3. Lockable plug 10 includes a barrier 90 configured to close top aperture 16 and a barrier lock 92 associated with barrier 90 and configured to retain barrier 90 in top aperture 16 to lock lockable plug 10 to capless fuel tank filler neck 11.

[0014] Barrier 90 of lockable plug 10 includes a lock housing 17 containing a barrier lock 13 configured to provide means for selectively anchoring lock housing 17 of lockable plug 10 to fill pipe closure unit 12 to close top aperture 16 and block unauthorized access to fill pipe 14 and fuel tank 15 as suggested, for example, in FIG. 3. In an illustrative embodiment, barrier lock 13 includes a movable plug retainer 20 and a “key-actuated” retainer controller 18 shown diagrammatically in FIG. 1 and illustratively in FIGS. 2 and 3. Retainer controller 18 is configured to provide control means for moving plug retainer 20 relative to barrier between an extended position shown in FIG. 3 and a retracted position shown in FIG. 2.

[0015] In an illustrative embodiment, a key 22 is used by an authorized person to move retainer controller 18 relative
to lock housing 17 to cause plug retainer 20 to move relative to lock housing 17 to assume a retracted position shown in FIGS. 1 and 2. When plug retainer 20 is retracted as suggested in FIG. 2, lockable plug 10 may be moved by a user relative to fill pipe closure unit 12 and into and out of top aperture 16 as suggested in FIGS. 1 and 2. Key 22 is also used by an authorized person to move retainer controller 18 relative to lock housing 17 to cause plug retainer 20 to move relative to lock housing 17 to assume an extended position shown in FIG. 3. When plug retainer 20 is extended as suggested in FIG. 3, lockable plug 10 is “locked” and thus retained in a fixed and anchored position in top aperture 16 to block entry into fill pipe 14 and fuel tank 15 through top aperture 16. Unauthorized insertion of instruments such as a siphon tube (not shown) into fill pipe 14 and fuel tank 15 through top aperture 16 is blocked while lockable plug 10 is locked in an anchored position in top aperture 16.

In an illustrative embodiment, filler neck 11 includes fill pipe 14 and fill pipe closure unit 12. Fill pipe 14 is coupled to fuel tank 15 and fill pipe closure unit 12 is coupled to an outer end 24 of fill pipe 14 as suggested, for example, in FIG. 1.

Capless fuel tank filler neck 11 is formed to include a nozzle-receiving passageway 26 as suggested in FIGS. 2 and 3. An outer portion 26a of nozzle-receiving passageway 26 is formed in lock housing 17 of lockable plug 10 as shown, for example, in FIG. 2. An inner portion 26b of nozzle-receiving passageway 26 is formed in fill pipe 14 as shown, for example, in FIG. 1. In the anchored position shown in FIG. 3, lockable plug 10 blocks movement of a fuel-dispensing pump nozzle (not shown) or other tube (not shown) into nozzle-receiving passageway 26 through top aperture 16.

Fill pipe closure unit 12 includes a plug housing 28 and an appearance door 30. Plug housing 28 is formed to include top aperture 16 sized to receive lockable plug 10 therein. Appearance door 30 is mounted for movement relative to plug housing 28 between a closed position shown in FIG. 1 closing top aperture 16 and an opened or withdrawn position shown in FIGS. 2 and 3 exposing top aperture 16. An O-ring seal (not shown) is also included in fill pipe closure unit 12 and coupled to an exterior portion of plug housing 28 and arranged to mate with an interior wall of fill pipe 14 to establish a liquid fuel and fuel vapor seal therebetween when fill pipe closure unit 12 is mounted in fill pipe 14. In an illustrative embodiment, lock housing 17 is formed to include a rounded, (e.g., hemispherical) bottom 19 to provide cam means for moving appearance door 30 from the closed position to the opened position during insertion of lock housing 17 into top opening 16 so as to facilitate insertion of lock housing 17 into capless fuel tank filler neck 11 through top aperture 16 against the spring-loaded appearance door 30.

In an illustrative embodiment, plug housing 28 includes an annular top wall 32 formed to include top aperture 16 and an annular retainer rim 34 appended to an underside 36 of annular top wall 32. Annular retainer rim 34 is arranged to extend around and border top aperture 16 and is configured to mate with plug retainer 20. It is within the scope of this disclosure to provide a discontinuous rim or other suitable structure adapted to be engaged with plug retainer 20 to anchor lockable plug 10 in the anchored position shown in FIG. 3. As suggested in FIG. 1, a downwardly extending tab 38 appended to housing 28 fits into an upwardly opening tab receiver 40 formed in fill pipe 14 to “lock” plug housing 28 against rotation about axis 100 relative to fill pipe 14.

Lockable plug 10 also includes a cover plate 42 coupled to a top portion of lock housing 17 as shown in FIGS. 1-3. Cover plate 42 is formed to include a central aperture 44 and retainer controller 18 is mounted in a chamber 118 formed in lock housing 17 to cause a key slot 46 formed in retainer controller 18 to be exposed and accessed through central aperture 44 as shown, for example, in FIG. 1. Cover plate 42 is arranged to extend in radially outward directions relative to central axis 100 and configured to rest on top wall 32 of plug housing 28 of fill pipe closure unit 12 when lockable plug 10 is inserted into upper portion 26a of nozzle-receiving passageway 26 and retainer controller 18 is arranged to extend through top aperture 16 into upper portion 26b of nozzle-receiving passageway 26 as shown, for example, in FIG. 2. Thus, cover plate 42 provides means for supporting lock housing 17 of lockable plug 10 in a stationary position in top aperture 16 formed in plug housing 28 whether lockable plug 10 is “unlocked” as shown in FIG. 2 or “locked” as shown in FIG. 3.

Plug retainer 20 includes a pair of retention arms 51, 52 and an arm mover 50 coupled to retention arms 51, 52 and to retainer controller 18 in an illustrative embodiment suggested in FIGS. 2 and 3. Arm mover 50 is configured to provide means for moving retention arms 51, 52 or other suitable retention devices, in response to a force applied by (or a mechanical or electrical or other signal received from) retainer controller 18, between retracted positions shown in FIGS. 1 and 2 inside lock housing 17 through apertures 54 formed in lock housing 17 and extended positions shown in FIG. 3 extending outside of lock housing 17. In the extended positions, retention arms 51, 52 engage a downwardly facing surface 35 provided on retention rim 34 as shown in FIG. 3 to prevent unauthorized withdrawal of lockable plug 10 from top opening 16 and upper portion 26a of nozzle-receiving passageway 26 formed in fill pipe closure unit 12.

In an illustrative embodiment, retainer controller 18 is a key-actuated cylinder lock coupled to arm mover 50. Key 22 can be inserted into key slot 46 formed in an outer face 47 of retainer controller 18 and then key 22 can be turned to actuate arm mover 50 to move retention arms 51, 52 relative to lock housing 17 either to the retracted positions shown in FIGS. 1 and 2 or to the extended positions shown in FIG. 3. When lockable plug 10 is not anchored in top aperture 16 of fill pipe closure unit 12, a fuel-dispensing pump nozzle (not shown) can be moved relative to fill pipe closure unit 12 to contact appearance door 30 and move door 30 to an opened position (shown in FIG. 2) so that the pump nozzle can be inserted into nozzle-receiving passageway 26 provided in capless fuel tank filler neck 11.

Anti-rotation means 60 is provided to prevent lockable plug 10 from rotating (i.e., spinning) about central axis 100 in top aperture 16 as key 22 is turned to lock and unlock lockable plug 10. In an illustrative embodiment, anti-rotation means 60 is coupled to lockable plug 10 and to fill pipe closure unit 12. It is within the scope of this disclosure to add a flat surface where lockable plug 10 contacts appearance door 30. It is within the scope of this
Disclosure to increase the vertical height of lock housing 17 to prevent a spring (not shown) biasing appearance door 30 to its closed position from pushing plug 10 upwardly during installation.

1. A capless filler neck barricade comprising a capless fuel tank filler neck formed to include a nozzle-receiving passageway and a top aperture opening into the nozzle-receiving passageway and a lockable plug including a barrier arranged to occlude the top aperture and a plug retainer mounted for movement relative to the barrier between an extended position engaging the capless fuel tank filler neck to retain the barrier in the top aperture to block unauthorized entry of a fuel-dispensing pump nozzle and a siphon tube into the capless fuel tank filler neck through the top aperture and a retracted position disengaging the capless fuel tank filler neck to allow removal of the barrier from the top opening.

2. The barricade of claim 1, wherein the lockable plug further includes control means for moving the plug retainer relative to the barrier between the extended and retracted positions.

3. The barricade of claim 2, wherein the control means includes a key-actuated lock cylinder.

4. The barricade of claim 3, wherein the barrier is formed to include a chamber and the key-actuated lock cylinder is arranged to extend into the chamber and to include an outer face formed to include a key slot and exposed through a central aperture formed in the barrier and arranged to open into the chamber.

5. The barricade of claim 2, wherein the plug retainer includes first and second retention arms and an arm mover configured to move first and second retention arms relative to the barrier to establish the extended and retracted positions of the plug retainer and the control means includes means for actuating the arm mover to move the first and second retention arms relative to the barrier.

6. The barricade of claim 5, wherein the plug retainer and the control means cooperate to define a barrier lock associated with the barrier and configured to retain the barrier in the top aperture formed in the capless fuel tank filler neck, the capless fuel tank filler neck includes a top wall formed to include the top aperture and a retainer rim appended to an underside of the top wall and arranged to extend into the nozzle-receiving passageway to define an outer boundary of the top aperture, the barrier includes a cover plate arranged to engage the top wall and a lock housing coupled to the cover plate and arranged to extend through the top aperture, the arm mover is configured to move the first and second retention arms from retracted positions inside the lock housing through apertures formed in the lock housing to extended positions outside of the lock housing to cause the first and second retention arms to engage a downwardly facing surface provided on the retention rim to lock the lockable plug and prevent unauthorized withdrawal of the lockable plug from the top aperture formed in the capless fuel tank filler neck.

7. The barricade of claim 1, wherein the capless fuel tank filler neck includes a fill pipe adapted to be coupled to a fuel tank and a fill pipe closure unit coupled to an outer end of fill pipe, the fill pipe closure unit is formed to include the top aperture and an outer portion of the nozzle-receiving passageway communicating with the top aperture, and the barrier is arranged to extend into the top aperture and the outer portion of the nozzle-receiving passageway.

8. The barricade of claim 7, wherein the fill pipe closure unit includes a plug housing formed to include the top aperture and an appearance door mounted for movement relative to the plug housing between a closed position closing the top aperture and an opened position exposing the top aperture, the lockable plug further includes a retainer controller coupled to the plug retainer to provide a barrier lock associated with the barrier, and the barrier includes a lock housing configured to contain the barrier lock and arranged to extend into the outer portion of the nozzle-receiving passageway through the top aperture and a cover plate coupled to the lock housing and arranged to rest on a top wall of the fill pipe closure unit in a location outside of the top aperture to provide means for supporting the lock housing in a stationary position in the top aperture when the plug retainer is moved to assume the extended position and when the plug retainer is moved to assume the retracted position.

9. The barricade of claim 7, wherein the fill pipe closure unit includes a top wall formed to include the top aperture, the barrier includes a cover plate arranged to mate with the top wall of the fill pipe closure unit and a lock housing arranged to extend through the top aperture into the nozzle-receiving passageway, and the plug retainer is mounted to the lock housing for movement between the extended and retracted positions.

10. The barricade of claim 9, wherein the fill pipe closure unit further includes a retainer rim appended to an underside of the top wall and arranged to extend into the nozzle-receiving passageway and the plug retainer is configured and arranged to engage a downwardly facing surface on the retainer rim to trap the retainer rim between the cover plate and the plug retainer upon movement of the plug retainer to the engaged position while the lock housing is arranged to extend through the top aperture into the nozzle-receiving passageway.

11. The barricade of claim 9, wherein the lock housing is formed to include a chamber, the cover plate is formed to include a central aperture opening into the chamber, the lockable plug further includes a retainer controller located in the chamber and configured to include an outer face formed to include a key slot and exposed through the central aperture, and the retainer controller is configured to provide means for moving the plug retainer between the engaged and retracted positions in response to movement of a key inserted into the key slot relative to the lock housing.

12. The barricade of claim 1, wherein the barrier includes a cover plate arranged to mate with the capless fuel tank filler neck and a lock housing arranged to extend through the top aperture into the nozzle-receiving passageway, and the plug retainer is mounted to the lock housing forming movement between the extended and retracted positions.

13. The barricade of claim 12, wherein the capless fuel tank filler neck further includes a retainer rim appended to an underside of the top wall and arranged to extend into the nozzle-receiving passageway and the plug retainer is configured and arranged to engage a downwardly facing surface on the retainer rim to trap the retainer rim between the cover plate and the plug retainer upon movement of the plug retainer to the engaged position while the lock housing is arranged to extend through the top aperture into the nozzle-receiving passageway.
14. The barricade of claim 13, wherein the plug retainer includes first and second retention arms and an arm mover configured to move the first and second retention arms relative to the barrier to establish the extended and retracted positions of the plug retainer, and each of the first and second retention arms engage the downwardly facing surface on the retainer rim upon movement of the plug retainer to the extended position.

15. The barricade of claim 13, wherein the lockable plug further includes means coupled to the lock housing for actuating the arm mover to move the first and second retention arms relative to the barrier.

16. The barricade of claim 12, wherein the lock housing is formed to include a chamber, the cover plate is formed to include a central aperture opening into the chamber, the lockable plug further includes a retainer controller located in the chamber and configured to include an outer face formed to include a key slot and exposed through the central aperture, and the retainer controller is configured to provide means for moving the plug retainer between the engaged and retracted positions in response to movement of a key inserted into the key slot relative to the lock housing.

17. The barricade of claim 16, wherein the retainer controller is a key-actuated lock cylinder.

18. A capless fuel tank filler neck barricade comprising a capless fuel tank filler neck formed to include a nozzle-receiving passageway and a top aperture opening into the nozzle-receiving passageway and a lockable plug including a barrier arranged to extend into the top aperture and a portion of the nozzle-receiving passageway to close the top aperture and a barrier lock coupled to the barrier and to the capless fuel tank filler neck to retain the barrier, the barrier lock including a retention arm mounted for movement relative to the barrier to an extended position to mate with a portion of the capless fuel tank filler neck to block removal of the barrier from the top aperture and the portion of the nozzle-receiving passageway.

19. The barricade of claim 18, wherein the barrier lock further includes a key-actuated lock cylinder mounted in a chamber formed in the barrier and means for moving the retention arm relative to the barrier to the extended position in response to movement of a key in a key slot formed in the key-actuated lock cylinder.

20. The barricade of claim 18, wherein the barrier includes a lock housing and a cover plate, the retention arm is mounted on the lock housing for movement between the extended position and a retracted position disengaging the portion of the capless fuel tank filler neck, and the cover plate is coupled to the lock housing and arranged to mate with the capless fuel tank filler neck to anchor the lockable plug in a fixed position in the capless fuel tank filler neck when the retention arm is moved to assume the extended position.

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