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United States Patent Application Publication	20250263915
Kind Code	A1
Publication Date	August 21, 2025
Inventor(s)	Schuster; Michael J.

Toilet Seals

Abstract

Disclosed are various embodiments for facilitating the installation of a toilet over a closet collar for a drain pipe. In one or more embodiments, a toilet seal assembly includes a seal ring, a component including a seal ring receptacle and a funnel, a sealing washer, and a plate. The seal ring can be configured to be positioned over a toilet closet collar. The seal ring receptacle can be configured to be positioned over the seal ring, and the funnel can be configured to be inserted into the toilet closet collar. The sealing washer can be configured to be positioned over the component having the seal ring and the funnel. The plate can be configured to be positioned over the sealing washer and under the toilet.

Inventors: **Schuster; Michael J. (Shorewood, IL)**

Applicant: **Danco, Inc.** (Irving, TX)

Family ID: **1000008589569**

Appl. No.: **19/202921**

Filed: **May 08, 2025**

Related U.S. Application Data

parent US continuation 17228870 20210413 PENDING child US 19202921
parent US continuation 15944442 20180403 parent-grant-document US 11021862 child US 17228870
parent US continuation 13771773 20130220 parent-grant-document US 10683653 child US 15944442
us-provisional-application US 61600794 20120220
us-provisional-application US 61667377 20120702

Publication Classification

Int. Cl.: **E03D11/16** (20060101); **E03D11/17** (20060101); **F16L5/10** (20060101)

U.S. Cl.:

CPC **E03D11/16** (20130101); **E03D11/17** (20130101); **F16L5/10** (20130101); Y10T29/49826 (20150115)

Background/Summary

CROSS-REFERENCE TO RELATED CASES [0001] This application is a continuation of, and claims priority to, co-pending U.S. Utility patent application Ser. No. 17/228,870 entitled “TOILET SEALS” and filed on Apr. 13, 2021, which is a continuation of, and claims priority to, Utility patent application Ser. No. 15/944,442 filed on Apr. 3, 2018, now U.S. Pat. No. 11,021,862, which is a a continuation of, and claims priority to, U.S. Utility patent application Ser. No. 13/771,773 entitled “CLOSET COLLAR ADAPTATIONS” and filed on Feb. 20, 2013, now U.S. Pat. No. 10,683,653, which claims the benefit of and priority to both U.S. Provisional Patent Application Ser. No. 61/600,794 entitled “CLOSET COLLAR ADAPTATION” and filed on Feb. 20, 2012 and U.S. Provisional Patent Application Ser. No. 61/667,377 entitled “CLOSET COLLAR ADAPTATION” and filed on Jul. 2, 2012. Each of these applications is incorporated by reference herein in its entirety.

BACKGROUND
[0002] A closet collar may provide a connection between a toilet and a drain pipe. Closet collars can be installed improperly making it difficult to install a toilet without a leaky seal.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0003] Many aspects of the present disclosure can be better understood with reference to the following drawings. The components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the disclosure. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.
[0004] FIGS. **1**A-**1**C are drawings showing examples of a closet collar according to various embodiments of the present disclosure.
[0005] FIGS. **2**A-**2**C are drawings showing examples of a closet collar adapter according to various embodiments of the present disclosure.
[0006] FIGS. **3**-**5** are drawings showing an example of a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0007] FIG. **6** is a drawing showing another example of a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0008] FIG. **7** is a drawing showing another example of a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0009] FIG. **8** is a drawing showing an example of clips that may be used with a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0010] FIGS. **9** and **10**A-**10**B are drawings showing examples of flexible seal rings that may be used with a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0011] FIGS. **11**-**14** are drawings showing an example of a sealing washer that may be used with a closet collar adaptation assembly according to various embodiments of the present disclosure.

[0012] FIG. **15** is a drawing showing another example of a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0013] FIG. **16** is a drawing showing another example of a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0014] FIGS. **17**A-**17**B are drawings of another example of a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0015] FIG. **18** is a drawing of an example of a toilet installed with a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0016] FIGS. **19-20** are drawings of a closet collar adaptation assembly with a lid according to various embodiments of the present disclosure.
[0017] FIG. **21** is a drawing of another example of a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0018] FIGS. **22**A-**22**B are drawings of an example of an adapter plate for a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0019] FIGS. **23**A-**23**D are drawings of another embodiment of a sealing washer for a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0020] FIGS. **24**A-**24**B are drawings showing another example of a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0021] FIGS. **25**A-**25**C are drawings showing examples of an adapter plate for a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0022] FIGS. **26**A-**26**C are drawings showing examples of a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0023] FIGS. **27**A-**27**B are drawings showing an example of a bellow for a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0024] FIG. **27**C is a drawing showing another example of a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0025] FIGS. **28**A-**28**B, **29**A-**29**B, and **30**A-**30**D are drawings showing examples of flexible rings for a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0026] FIGS. **31**A-**31**B and **32**A-**32**C are drawings showing another example of a closet collar adaptation assembly according to various embodiments of the present disclosure.
[0027] FIGS. **33**A-**33**B are drawings showing another example of a closet collar adapter for a closet collar adaptation assembly according to various embodiments of the present disclosure.

DETAILED DESCRIPTION

[0028] With reference to FIGS. **1**A, **1**B, and **1**C, shown are examples of closet collars **100** upon which toilets may be installed. The closet collars **100** provide the drain point for a toilet where sewage leaves the toilet and is provided to a sewage system as can be appreciated. The closet collars **100** are shown relative to flooring **103**. In the embodiment of FIG. **1**A, the closet collar **100** is recessed with respect to the flooring **103** so that the upper surface of the closet collar **100** is flush with the surface of the flooring **103**. Such may occur, for example, where the closet collar **100** is installed on subflooring and then finished flooring **103** is installed around the closet collar **100**. For example, ceramic tile or other types of a flooring **103** may be installed on subflooring and result in the upper surface of the closet collar **100** being flush with the surface of the flooring **103**. Referring to FIG. **1**B, shown is a situation in which the closet collar **100** is recessed with respect to the flooring **103** such that the top surface of the closet collar **100** is below the top surface of the flooring **103**. Such may occur, for example, where the closet collar **100** is installed onto subflooring and then finished flooring having a relatively large thickness is installed around it. With reference to FIG. **1**C, shown is a situation in which the closet collar **100** is installed on top of the flooring **103**. In the embodiment of FIG. **1**C, the top surface of the closet collar **100** is above the top surface of the flooring **103**. As contemplated herein, the closet collar **100** in any given installation might fall within any one of the configurations described with reference to FIGS. **1**A, **1**B, or **1**C.

[0029] With reference to FIGS. **2**A, **2**B, and **2**C, shown is an example of a closet collar adapter **113** according to various embodiments. A closet collar adapter **113** includes a pipe extension **116** that is configured to extend down into a closet collar **100** (FIGS. **1**A-**1**C). Also, a sealing washer **119** may be disposed on top of the closet collar adapter **113**. According to various embodiments, the sealing washer **119** may be affixed to an upper surface of the closet collar adapter **113** by way of an appropriate adhesive, for example, thereby forming a sealed junction between the sealing washer **119** and the upper surface of the closet collar adapter **113**. In alternative embodiments, the sealing washer **119** may be affixed to the upper surface of the closet collar adapter **113** by being overmolded or by using any other suitable process. In further alternative embodiments, the sealing washer **119** and the closet collar adapter **113** may be integrally molded as a single part. The sealing washer **119** may be made from rubber or other appropriate material that facilitates an appropriate seal with a horn extending from the underside of a toilet as will be described.

[0030] With reference to FIG. **3**, shown is an example of a closet collar adaptation assembly **200** according to various embodiments of the present disclosure. According to various embodiments, the closet collar adaptation assembly **200** may include the closet collar adapter **113**, a flexible seal ring **203**, one or more anchor bolts **206**, the sealing washer **119**, and possibly other components. The closet collar adapter **113** may mount to and form a seal with the closet collar **100**. Although the embodiment of FIG. **3** shows the components of the closet collar adaptation assembly **200** as being separate components, in alternative embodiments, one or more of the components of the adaptation assembly **200** may be integrally molded as a single component. In further alternative embodiments, one or more of the components of the closet collar adaptation assembly **200** may be bonded to form a single component using, for example, an overmolding process or any other suitable method.

[0031] Positioned above the closet collar adaptation assembly **200** is the bottom of a toilet **213** that includes the horn **216**. The horn **216** of the toilet **213** mates with the closet collar adaptation assembly **200** to form a seal between the horn **216** and the closet collar **100**. The seal between the horn **216** and the closet collar adaptation assembly **200** facilitates the passage of sewage matter from the toilet **213** through the closet collar **100** and down the drain pipe as can be appreciated.

[0032] The flexible seal ring **203** may be made of a material that facilitates the flexible seal ring **203** flexing and at least partially collapsing with pressure, thereby forming a seal between the underside of the closet collar adapter **113** and the sealing surface of the closet collar **100**. In alternative embodiments, a wax ring may be used instead of or in addition to the flexible seal ring **203**. Such a flexible seal ring **203** may be made of, for example, neoprene, foam rubber, polyvinylchloride (PVC) rubber, thermoplastic elastomer (TPE), thermoplastic rubber (TPR), styrene-butadiene rubber (SBR), ethylene propylene diene monomer (EPDM) rubber, or any other material that facilitates the flexible seal ring **203** at least partially collapsing and sealing against the respective surfaces. These materials may facilitate the flexible seal ring **203** being reusable, unlike a wax ring which typically is made for a single use. In this sense, when the toilet **213** and/or the closet collar adaptation assembly **200** is removed, the flexible seal ring **203** may return at least partially to the shape in which it was prior to the toilet **213** and/or the closet collar adaptation assembly **200** causing the flexible seal ring **203** to at least partially collapse. Additionally, the flexible seal ring **203** may comprise an antimicrobial material. For example, the flexible seal ring **203** may comprise an antimicrobial coating.

[0033] Additionally, the material selected for the flexible seal ring **203** may be chosen so that it may withstand the corrosive effects of the sewage gases and matter that flows from the toilet **213** into the drain through the closet collar **100** as can be appreciated. The closet collar adaptation assembly **200** is shown in FIG. **3** using an exploded view in which components have not yet been completely assembled.

[0034] Referring to FIG. **4**, shown is the closet collar adaptation assembly **200** in which the closet collar adapter **113** has been pushed down onto the flexible seal ring **203**, thereby compressing the flexible seal ring **203** as shown. The sealing washer **119** is disposed at the top of the closet collar

adapter **113** and includes a hole through which the horn **216** of the toilet **213** protrudes. The sealing washer **119** may thereby form a seal with the sides of the horn **216** to prevent sewage gases or other matter from escaping during the toilet flush cycle or at other times. The anchor bolts **206** may be restricted to the closet collar **100** in holes or slots that are typically found within closet collars **100** as can be appreciated.

[0035] With reference to FIG. **5**, shown is an example of the closet collar adaptation assembly **200** in which the toilet **213** has been placed over the closet collar adaptation assembly **200** and the horn **216** has been pressed through the center opening of the sealing washer **119**. As shown, the sealing washer **119** may be stretched down around the sides of the horn **216**, thereby forming a seal between the side of the horn **216** and the sealing washer **119**. In addition, wax may be provided at strategic locations inside the closet collar adapter **113** so that the sides of the horn **216** may come into contact with the wax to form a seal in addition to, or as an alternative to, the use of the sealing washer **119**. For example, such wax may be placed in the corner **223** or in other locations formed in the closet collar adapter **113**. As a result, the wax may contact a portion of the horn **216** to further form a seal between the horn **216** and closet collar adapter **113**. In alternative embodiments, the side walls of the closet collar adapter **113** may be shaped to provide for holding areas or reservoirs in which wax or other sealants may be retained. When the horn **216** is inserted into closet collar adapter **113**, the wax or other sealants in the holding areas or reservoirs may come into contact with the horn **216**. The holding areas or reservoirs may provide for greater precision in terms of sealing to prevent sewage leaks and may also facilitate assembly and/or installation of the closet collar adaptation assembly **200**.

[0036] With reference to FIG. **6**, shown is a closet collar adaptation assembly **300** according to another embodiment of the present disclosure. The closet collar adaptation assembly **300** is similar to the closet collar adaptation assembly **200** described above, with the exception that the closet collar adaptation assembly **300** shown in FIG. **6** includes multiple flexible seal rings **203***a* and **203***b* that are sandwiched together as shown. In the embodiment shown in FIG. **6**, the closet collar adaptation assembly **300** includes two flexible seal rings **203***a* and **203***b*. However, fewer or greater quantities of flexible seal rings **203***a* and **203***b* may be used in alternative embodiments. Having multiple flexible seal rings **203***a* and **203***b* may provide a proper seal between the closet collar adapter **113** and the closet collar **100** when the closet collar **100** is recessed relatively far down in the flooring **103** (FIG. **1**) as can be appreciated.

[0037] With reference to FIG. **7**, shown is another example of a closet collar adaptation assembly **330** according to various embodiments. The closet collar adaptation assembly **330** in the embodiment of FIG. **7** includes an adapter plate **333** that includes a hole through which the horn **216** (FIG. **3**) of a toilet may protrude. The sealing washer **119** may be affixed to the top of the adapter plate **333** and may form a sealed joint therebetween. The flexible seal ring **203** is disposed between the adapter plate **333** and the closet collar **100** as shown. The horn **216** of a toilet may be positioned to extend through the sealing washer **119** and the inner hole of the adapter plate **333**, thereby forming a seal between the sides of the horn **216** of the toilet, as described above, via the sealing washer **119**. Thus, the closet collar adaptation assembly **330** provides for the installation of a toilet **213** without the use of the closet collar adapter **113** described above.

[0038] Although the embodiment of FIG. **7** shows the components of the closet collar adaptation assembly **330** as being separate components, in alternative embodiments, one or more of the components of the adaptation assembly **330** may be integrally molded as a single component. In further alternative embodiments, one or more of the components of the closet collar adaptation assembly **330** may be bonded to form a single component using, for example, an overmolding process or any other suitable method. For example, the sealing washer **119** may be overmolded to the adapter plate **333** in various embodiments.

[0039] Referring next to FIG. **8**, shown is a view of an example of clips **353** that may be used with various closet collar adaptation assemblies **200** according to various embodiments. In FIG. **8**, the

clips **353** are shown being used with the closet collar adaptation assembly **200**. In alternative embodiments, the clips **353** may be used with the closet collar adaptation assembly **300** (FIG. **6**), the closet collar adaptation assembly **330** (FIG. **7**), or with other embodiments. The clips **353** may be slid onto the anchor bolts **206** so that they make contact with the sealing washer **119** (FIG. **2**) that is disposed on top of the closet collar adapter **113**. The clips **353** may be pushed down such that the flexible seal ring (not shown) is compressed by the clips **353** to hold the closet collar adaptation assembly **200** and to hold the anchor bolts **206** in place, thereby facilitating the toilet **213** (FIG. **3**) being positioned over the closet collar adaptation assembly **200**.

[0040] Referring to FIG. **9**, shown are two examples of the flexible seal ring **203**, denoted here as flexible seal ring **203***c* and flexible seal ring **203***d*. The flexible seal ring **203***c* may comprise foam rubber, PVC rubber, neoprene, or other types of sealing materials. Such materials may be antimicrobial according to various embodiments. Additionally, the flexible seal ring **203** according to various embodiments may comprise a coating, such as an antimicrobial coating. The flexible seal ring **203***d* may be manufactured from extruded rubber or other types of suitable materials as can be appreciated.

[0041] Referring next to FIGS. **10**A and **10**B, shown are cross-sectional views of the flexible seal rings **203***c* and **203***d*. As shown, the flexible seal ring **203***d* has several walls that may facilitate the flexible seal ring **203***d* at least partially collapsing when compressed. The flexible seal ring **203***c* comprises a material that may facilitate the flexible seal ring **203***c* at least partially collapsing to form the appropriate seals as can be appreciated.

[0042] With reference to FIGS. **11**, **12**, **13**, and **14**, shown is the sealing washer **119** positioned on the upper flat surface of the closet collar adapter **113** according to various embodiments. In the embodiments of FIGS. **11**, **12**, **13**, and **14**, the sealing washer **119** comprises a center hole **403** with a radius that is less than the radius of the opening **406** for the closet collar adapter **113**. According to various embodiments, the closet collar adapter **113** may comprise one or more holes **409** through which bolts, screws, or any other suitable type of fasteners may insert to hold at least portions of the system down as can be appreciated.

[0043] Referring next to FIG. **15**, shown is another example of a closet collar adaptation assembly **500** according to various embodiments. The closet collar adaptation assembly **500** in the embodiment of FIG. **15** includes the sealing washer **119** and the closet collar adapter **113**. In addition, disposed over the closet collar adapter **113** is an adapter plate **503**. The adapter plate **503** may be constructed of steel, aluminum, or other metal as can be appreciated. In alternative embodiments, the adapter plate **503** may be constructed of plastic, for example, or any other type of suitable material. The adapter plate **503** according to various embodiments may also comprise an integrated antimicrobial agent. Additionally or alternatively, various embodiments of the adapter plate **503** may include an antimicrobial coating, such as an antimicrobial paint, an antimicrobial metal powder coating, or any other type of finish.

[0044] Although the embodiment of FIG. **15** shows the components of the closet collar adaptation assembly **500** as being separate components, in alternative embodiments, one or more of the components of the adaptation assembly **500** may be integrally molded as a single component. In further alternative embodiments, one or more of the components of the closet collar adaptation assembly **500** may be bonded to form a single component using, for example, an overmolding process or any other suitable method. For example, the sealing washer **119**, the closet collar adapter **113**, and/or other components may be overmolded to the adapter plate **503** in various embodiments.

[0045] The adapter plate **503** may include one or more legs **506** that can be used to fasten the adapter plate **503** to the flooring **103** (FIG. **1**A), thereby holding the closet collar adaptation assembly **500** in proper position with respect to the closet collar **100** (FIG. **1**A). It may be that the feet of the legs **506** come into contact with the flooring **103**, or they might be suspended above the flooring **103** such that a screw or bolt rigidly adheres the legs **506** to the flooring **103**.

[0046] Protruding from the adapter plate **503** are bolts **509** that may be, for example, affixed

directly to the adapter plate **503** according to various embodiments. The bolts **509** may insert into corresponding holes in the toilet **213** (FIG. **3**) and be used to fasten the toilet **213** to the closet collar adaptation assembly **500**. The flexible seal ring **203** may be disposed under the closet collar adapter **113** as described above. The adapter plate **503** may provide greater stability in that it may be attached to the flooring **103** around the closet collar **100** for cases, for example, where the closet collar **100** may be broken or otherwise compromised. In addition, screws may be used to affix the adapter plate **503** to the floor structure through the holes **513** as shown. Such screws may protrude through the flexible seal ring **203** according to various embodiments.

[0047] With reference to FIG. **16**, shown is an example of the closet collar adaptation assembly **500** after it has been installed over a closet collar **100** (not visible) such that the legs **506** come into contact with flooring **103**. By bolting the adapter plate **503** to the flooring **103**, greater stability of the connection between the toilet and the closet collar **100** may be provided.

[0048] With reference to FIGS. **17**A and **17**B, shown are additional drawings of the closet collar adaptation assembly **500** according to various embodiments of the present disclosure. In particular, FIG. **17**A shows a partially-exploded side view, and FIG. **17**B shows a partially-exploded cross-section view of the closet collar adaptation assembly **500** according to various embodiments. According to various embodiments, the sealing washer **119** may include thickened portions **533** along the outside diameter of the sealing washer **119** that are configured to contact the adapter plate **503**. According to various embodiments, the thickened portions **533** may be adhered to the adapter plate **503**. Also, the sealing washer **119** is configured to contact the closet collar adapter **113**. According to various embodiments, the sealing washer **119** may be sealed or affixed to the closet collar adapter **113** to form a seal between the closet collar adapter **113** and the sealing washer **119**. Thus, the sealing washer **119** may be affixed to both the closet collar adapter **113** and the adapter plate **503** to promote a seal to prevent sewage gases from escaping as can be appreciated. In another embodiment, the sealing washer **119** may comprise a constant thickness and simply may be bent down around the upper surface of the closet collar adapter **113** to be affixed to the adapter plate **503**.

[0049] With reference to FIG. **18**, shown is the closet collar adaptation assembly **500** for which a toilet **213** has been installed over a closet collar **100**. As shown, the sealing washer **119** makes contact with the horn **216** of the toilet **213**. Additionally, the sealing washer **119** may be adhered to both the closet collar adapter **113** and the adapter plate **503** so as to prevent sewage gases from escaping through the junction of the closet collar adapter **113** and the adapter plate **503**.

[0050] Referring to FIGS. **19** and **20**, shown is the closet collar adaptation assembly **500** with a lid **553** positioned over the opening provided by the closet collar adaption assembly **500**. The lid **553** may include protrusions **556** into which the anchor bolts **206** may insert to thereby facilitate the anchor bolts **206** coupling the lid **553** to the closet collar adaptation assembly **500**. In some embodiments, the protrusions **556** may include internal teeth, ribs, and/or other features that may facilitate the anchor bolts **206** being restricted in the protrusions **556**. The lid **553** being coupled to the closet collar adaptation assembly **500** may provide a seal over the closet collar **100**.

[0051] With reference to FIG. **21**, shown is an example of the closet collar adaptation assembly **600** according to another embodiment of the present disclosure. As shown, the closet collar adaptation assembly **600** includes the closet collar adapter **113** that is positioned over the closet collar **100** with the flexible seal ring **203** disposed therebetween. As shown, the flexible seal ring **203** may provide a direct seal between the closet collar adapter **113** and the closet collar **100**. The sealing washer **119** is disposed on the upper surface of the closet collar adapter **113**. In addition, an adapter plate **603** is positioned above the sealing washer **119**. The adapter plate **603** may be affixed to the sealing washer **119** by, for example, an appropriate adhesive, fasteners, or any other suitable mechanism. Alternatively, the adapter plate **603** may simply be placed over the assembly as shown. The adapter plate **603** may include holes **513** (FIG. **15**) and legs **506** (FIG. **15**) that are not shown in the embodiment of FIG. **21**. Bolts **606** extend from the upper surface of the adapter plate **603** in

the present embodiment.
[0052] According to various embodiments, the closet collar adaptation assembly **600** may be advantageous in that there are fewer joints to seal to prevent sewage gases and other matter from escaping the joint between the toilet **213** (FIG. **3**) and the closet collar **100**. Specifically, the flexible seal ring **203** provides for sealing between the closet collar adapter **113** and the closet collar **100**. Also, the sealing washer **119** is directly positioned on the upper surface of the closet collar adapter **113**. This may provide greater surface area for a greater seal. Further, the adapter plate **603** may provide greater stability for all of the seals and may hold the entire closet collar adaptation assembly **600** in place over the closet collar **100** as can be appreciated.
[0053] In addition, a plug **609** may be provided that may be pushed into the hole presented by the sealing washer **119** to plug the hole over the closet collar **100**. The plug **609** may prevent the escape of sewage gases when a toilet has not been installed. To this end, the plug **609** may be employed with any one of the embodiments of the various closet collar adaptation assemblies described herein.
[0054] Although the embodiment of FIG. **21** shows the components of the closet collar adaptation assembly **600** as being separate components, in alternative embodiments, one or more of the components of the adaptation assembly **600** may be integrally molded as a single component. In further alternative embodiments, one or more of the components of the closet collar adaptation assembly **600** may be bonded to form a single component using, for example, an overmolding process or any other suitable method. For example, the sealing washer **119**, the closet collar adapter **113**, and/or other components may be overmolded to the adapter plate **603** in various embodiments.
[0055] With reference to FIGS. **22**A-**22**B, shown is the adapter plate **503** according to various embodiments. In the embodiment shown, the bolts **706***a*-**706***b* are separate components from the adapter plate **503**. The adapter plate **503** in FIGS. **22**A-**22**B includes one or more holes **703***a*-**703***d* to receive the bolts **706***a*-**706***b*. The bolts **706***a*-**706***b* may be passed into the corresponding holes **703***a*-**703***d* so that the bolt heads **709***a*-**709***b* may be flush with the adapter plate **503**. A press fit, threads, or any other suitable type of mechanism may retain the bolts **706***a*-**706***b* in the holes **703***a*-**703***d*.
[0056] Turning now to FIGS. **23**A-**23**E, shown is an interaction of the adapter plate **503** and the sealing washer **119** according to various embodiments. In the embodiment shown, the adapter plate **503** now includes one or more receptacles **713**, and the sealing washer **119** includes corresponding protrusions **716**. When the sealing washer **119** is seated on the adapter plate **503** during assembly, for example, the protrusions **716** of the sealing washer **119** may insert into the receptacles **713** of the adapter plate **503**. Having the protrusions **716** fit in the receptacles **713** may facilitate a proper concentric alignment of the sealing washer **119** with respect to the adapter plate **503**. As best shown in FIG. **23**E, the sealing washer **119** may also include a lip **719** that provides a space to accommodate the closet collar adapter **113**, as will be shown later.
[0057] With reference to FIG. **24**A, shown is the closet collar adaptation assembly **200** according to various embodiments. The closet collar adaptation assembly **200** may include the adapter plate **503**, the closet collar adapter **113**, the sealing washer **119**, and potentially other components. The adapter plate **503** may be mounted to the surface of the flooring **103**, and the closet collar adapter **113** may be seated on the adapter plate **503** as shown. Additionally, the sealing washer **119** may be seated on the closet collar adapter **113** and the adapter plate **503**. A portion of the closet collar adapter **113** may also fit between the adapter plate **503** and the lip **719** of the sealing washer **119**. By the protrusions **716** of the sealing washer **119** being inserted into the receptacles **713** of the adapter plate **503**, proper concentric alignments of the adapter plate **503**, the sealing washer **119**, and the closet collar adapter **113** may be obtained. As shown in FIG. **24**A, the bolts **706***a*-**706***b* may pass through and be retained in the corresponding holes **703***a*-**703***b* of the adapter plate **503** so that the bolt heads **709***a*-**709***b* are flush with the adapter plate **503**.
[0058] Turning to FIG. **24**B, shown is the closet collar adaptation assembly **200** according to

various embodiments. As shown in FIG. **24**B, the closet collar adapter **113** may be flexible to accommodate various flooring **103**, closet collar **100**, and/or drain pipe geometries. To this end, the closet collar adapter **113** may comprise a neoprene, foam rubber, polyvinylchloride (PVC) rubber, thermoplastic elastomer (TPE), thermoplastic rubber (TPR), styrene-butadiene rubber (SBR), ethylene propylene diene monomer (EPDM) rubber, flexible PVC, or another type of suitable material. One or more of the components of the closet collar adaptation assembly **200**, such as the closet collar adapter **113** and/or the sealing washer **119** may comprise an antimicrobial material, such as an integrated antimicrobial agent and/or an antimicrobial coating.

[0059] Further, one or more of the components of the closet collar adaptation assembly **200**, such as the closet collar adapter **113** and/or the sealing washer **119**, may be constructed using an overmolding process. The use of thermoplastic rubber flexible PVC, or thermoplastic elastomer may facilitate construction of the closet collar adapter **113** using injection molding processes. Additionally, one or more of the components of the closet collar adaptation assembly **200**, such as the closet collar adapter **113** and/or the sealing washer **119** may be integrally molded as a single part according to various embodiments.

[0060] Turning to FIG. **25**A, shown is an alternative embodiment of the adapter plate **503** according to various embodiments. As shown, the clips **353** may be formed as part of the adapter plate **503**. The clips **353** may also accept and retain the anchor bolts **206**. The clips **353** in the present embodiment comprise mouths that may grip anchor bolts **206**.

[0061] Referring now to FIG. **25**B, shown is another embodiment of the adapter plate **503**. In this embodiment, the adapter plate **503** includes elongated slots **803** that receive the anchor bolts **206** (FIG. **3**). Because the slots **803** are elongated, the closet collar adapter **113** may accept anchor bolts **206** that are at various radial distances with respect to the center of the adapter plate **503**.

[0062] Turning to FIG. **25**C, shown is another embodiment of the adapter plate **503**. In the embodiment shown, elongated clips **806** are now formed as part of the adapter plate **503**. The elongated clips **806** in the present example comprise teeth that may grip anchor bolts **206** (FIG. **3**). The elongated clips **806** may accept and retain the anchor bolts **206** that are at various radial distances with respect to the center of the adapter plate **503**.

[0063] With reference to FIGS. **26**A-**26**C, shown is the closet collar adaptation assembly **200** according to various embodiments. As shown, the adapter plate **503** may be seated on the flooring **103**. Also, the closet collar adapter **113** may be seated between the sealing washer **119** and the adapter plate **503**. The sealing washer **119** and/or the closet collar adapter **113** may be glued to the adapter plate **503**, for example, during assembly of the closet collar adaptation assembly **200**. Further, the sealing washer **119** and the closet collar adapter **113** may be glued together. In some embodiments, gluing the closet collar adapter **113** may be omitted, because the closet collar adapter **113** may be seated and retained between the sealing washer **119** and the adapter plate **503**.

[0064] As best shown in FIG. **26**C, the bottom opening of the pipe extension **116** for the closet collar adapter **113** is at a level that is lower than the top opening of the closet collar **100**. Thus, wastes passing through the pipe extension **116** may pass from the closet collar adapter **113** through the closet collar **100**.

[0065] Turning now to FIGS. **27**A-**27**B, shown is a bellow **550** according to various embodiments. The bellow **550** may include a first lip **553**, a second lip **556**, a ridge **559**, and a collapsible portion **563**. The bellow **550** may comprise a flexible material, such as flexible PVC, thermoplastic rubber, a thermoplastic elastomer, or any other type of material. In various embodiments, the bellow **550**, sealing washer **119**, closet collar adapter **113**, and/or other components may be constructed using overmolding techniques. For example, these components may be overmolded to the adapter plate **503** using through-holes in the adapter plate **503** to facilitate a bond between the components.

[0066] With reference now to FIG. **27**C, shown is the closet collar adaptation assembly **200** according to various embodiments. The closet collar adaptation assembly **200** includes the adapter plate **503** seated on the flooring **103**. The sealing washer **119** may be seated on the adapter plate

503, and the closet collar adapter **113** may be seated between the adapter plate **503** and the sealing washer **119**. Additionally, the bellow **550** may be disposed between the top of the closet collar **100** and the bottom of the adapter plate **503**. In this sense, the first lip **553** of the bellow **550** may be in contact with the adapter plate **503**, and the second lip **556** and the ridge **559** may be in contact with the closet collar **100**. In some embodiments, an adhesive may be disposed on the first lip **553** and/or the second lip **556** to facilitate installation and/or a seal. Also, in various embodiments, the first lip **553** of the bellow may be overmolded to the adapter plate **503**. Thus, the bellow **550** may act as a seal and thereby prevent liquids and/or gases from escaping from the closet collar adaptation assembly **200**.

[0067] One or more of the flexible rings **555** may be located between the bellow **550** and the flooring **103**. The flexible rings **555** may comprise rubber, foam, or any other type of material. Additionally, the flexible rings **555** may be compressible and thereby facilitate the closet collar adaptation assembly **200** being compatible with closet collars **100** that are at various heights with respect to the flooring **103**.

[0068] Turning now to FIG. **28**A, shown is an alternative embodiment of the flexible ring **555** according to various embodiments. The flexible ring **555** may include one or more grooves **570**, for example, along an exterior circumference of the flexible ring **555**. The flexible ring **555** may be manufactured using an extrusion process or other type of process, and ends of the extruded material may be glued together in order to form the ring shape.

[0069] FIG. **28**B shows an interaction of the flexible ring **555** of FIG. **28**A with the bellow **550** according to various embodiments. The flexible ring **555** may be disposed between the first lip **553** and the second lip **556** of the bellow **550**.

[0070] With reference to FIG. **29**A, shown is an interaction of the bellow **550** with the flexible ring **555** according to various embodiments. In the embodiment shown, the flexible ring **555** has a circular cross-section. As shown, the collapsible portion **563** of the bellow **550** may at least partially collapse. Upon the collapsible portion **563** at least partially collapsing due to a force exerted, for example by the adapter plate **503**, the first lip **553** and second lip **556** may be in contact with the flexible ring **555**.

[0071] Turning now to FIG. **29**B, shown is an interaction of the bellow **550** with the flexible ring **555** according to further embodiments. In this embodiment, the flexible ring **555**, referred to herein as the flexible ring **555***a*, may be a portion that has been cut and removed from the flexible ring **555** shown in FIG. **28**A.

[0072] With reference to FIG. **30**A shown is an alternative embodiment of the flexible ring **555***a*. FIG. **30**A shows multiple flexible rings **555**, referred to herein as the flexible ring **555***a* and the flexible ring **555***b*. The flexible rings **555***a*-**555***b* may be hollow according to various embodiments.

[0073] FIG. **30**B shows an interaction of the flexible rings **555***a*-**555***b* of FIG. **30**A with the bellow **550** according to various embodiments. One or more flexible rings **555***a*-**555***b* may be stacked to facilitate a proper seal between the closet collar adapter **113** (FIG. **24**A) and the closet collar **100** (FIG. **24**A) when the closet collar **100** is recessed in the flooring **103** (FIG. **24**A).

[0074] With reference to FIGS. **30**C-**30**D, shown is an alternative embodiment of the first flexible ring **555***a* and the second flexible ring **555***b* and their interactions with the bellow **550** according to various embodiments. As shown, the first flexible ring **555***a* and the second flexible ring **555***b* may be connected at a joint **575** and thus formed as a single component. A user, for example, may cut along the joint **575** to separate the first flexible ring **555***a* from the second flexible ring **555***b*.

[0075] Referring to FIGS. **31**A-**31**B, shown is an alternative embodiment of the closet collar adaptation assembly **200** according to various embodiments. In the embodiment shown, the closet collar adaptation assembly **200** includes the sealing washer **119**, the adapter plate **503**, one or more flexible rings **555**, and the closet collar adapter **113**. The closet collar adapter **113** in the embodiment shown may perform a similar function as the bellow **550** (FIG. **30**A) discussed above. In particular, the closet collar adapter **113** in the present embodiment may act as a seal and thereby

prevent liquids and/or gases from escaping from the closet collar adaptation assembly **200**. To this end, the closet collar adapter **113** may include a first lip **602**, a second lip **604**, and a collapsible portion **605**. As best shown in FIG. **31**B, the first lip **602** may abut the adapter plate **503** and one of the flexible rings **555**. Similarly, the second lip **604** may abut the closet collar **100** and one of the flexible rings **555**. Thus, the closet collar adapter **113** may provide a seal and thereby prevent liquids and/or gases from escaping from the closet collar adaptation assembly **200**.

[0076] In some embodiments, the first lip **602** may be positioned between the adapter plate **503** and the sealing washer **119**. Also, some or all of the flexible components may be molded as a single component. For instance, all of the flexible components may be overmolded onto the adapter plate **503**.

[0077] Referring to FIG. **32**A, shown is an example of a portion of the closet collar adaptation assembly **200** of FIGS. **31**A-**31**B for which a single flexible ring **555** is being used. As shown, the first lip **602** and the second lip **604** of the closet collar adapter **113** are in contact with the flexible ring **555**, and the collapsible portion **605** of the closet collar adapter **113** is now at least partially collapsed.

[0078] With reference to FIG. **32**B, shown is an example of a portion of the closet collar adaptation assembly **200** of FIGS. **31**A-**31**B according to various embodiments. In the present example, a portion of the flexible ring **555** of FIG. **28**A is being used. As shown, the first lip **602** and the second lip **604** of the closet collar adapter **113** are in contact with the flexible ring **555**, and the collapsible portion **605** of the closet collar adapter **113** is now at least partially collapsed.

[0079] Referring to FIG. **32**C, shown is an example of a portion of the closet collar adaptation assembly **200** of FIGS. **31**A-**31**B for the case in which a flexible ring **555** (FIG. **32**B) is not used. As shown, the collapsible portion **605** of the closet collar adapter **113** has partially collapsed to an extent that is even greater than as shown in FIGS. **32**A-**32**B.

[0080] With reference now to FIGS. **33**A-**33**B, shown is another example of a closet collar adapter **113** according to various embodiments. The closet collar adapter **113** shown may include a lip **750**, a collapsible portion **753**, a base **756**, and the pipe extension **116**. The collapsible portion **753** may further include a first portion **759**, a second portion **763**, and a third portion **766** of the closet collar adapter **113**. A first edge **769** may connect the first portion **759** and the second portion **763** of the collapsible portion **753**. Further, a second edge **773** may connect the second portion **763** and the third portion **766** of the collapsible portion **753** of the closet collar adapter **113**. Additionally, a third edge **774** may connect the third portion **766** of the collapsible portion **753** to the base **756**.

[0081] The first portion **759** of the collapsible portion **753** of the closet collar adapter **113** may have a wall thickness that is greater than the wall thickness of the second portion **763** and the third portion **766** of the collapsible portion **753**. Additionally, the second edge **773** may be recessed inward with respect to the closet collar adapter **113**. The base **756** may further include a first portion **776** and a second portion **779**. The wall for the first portion **776** of the base **756** may be thinner than the wall for the second portion **779** of the base.

[0082] Turning to FIG. **33**C, shown is another embodiment of the closet collar adaptation assembly **200** for which the closet collar adapter **113** of FIG. **33**A is being used. As shown, the lip **750** of the closet collar adapter **113** may be disposed between the sealing washer **119** and the adapter plate **503**. The base **756** of the closet collar adapter may be seated on the closet collar **100**. One or more flexible rings **555** may be disposed between the closet collar adapter **113** and the flooring **103** as shown.

[0083] With reference to FIG. **33**D, shown is a portion of the closet collar adaptation assembly **200** of FIG. **33**B for the case in which a single flexible ring **555** is being used. As shown, the collapsible portion **753** of the closet collar adapter **113** has partially collapsed. In particular, the first portion **776** of the base **756** may flex and thereby facilitate the base **756** displacing downward. Additionally, the third edge **774** of the collapsible portion **753** may flex and facilitate the third portion **766** of the collapsible portion **753** displacing downward. Thus, a vertical distance between

the third edge **774** and the second edge **773** may decrease.
[0084] The second portion **763** of the collapsible portion **753** may extend inward and downward by flexing about the second edge **773** and the first edge **769**. As such, a vertical distance between the first edge **769** and the second edge **773** may decrease. Additionally, the first edge **769** may flex and facilitate the lip **750** and the first portion of the collapsible portion **753** displacing downward.
[0085] Turning now to FIG. **33**E, shown is a portion of the closet collar adapter **113** collapsed, for example, in the event that a flexible ring **555** (**33**D) is not being used in conjunction with the closet collar adaptation assembly **200** (FIG. **33**D).
[0086] It is emphasized that the above-described embodiments of the present disclosure are merely possible examples of implementations set forth for a clear understanding of the principles of the disclosure. Many variations and modifications may be made to the above-described embodiment(s) without departing substantially from the spirit and principles of the disclosure. All such modifications and variations are intended to be included herein within the scope of this disclosure.

Claims

1. A toilet seal comprising: a base configured to engage with a closet collar; a collapsible body comprising a lower portion connected to the base, an upper portion, and a middle portion disposed between the lower portion and the upper portion; an aperture extending through the collapsible body and the base to allow fluid communication from a horn of a toilet to a drain pipe connected to the closet collar; wherein the collapsible body is configured to extend upwardly from the base prior to installation of the toilet on the toilet seal; and wherein the collapsible body is configured to at least partially collapse downwardly after installation of the toilet on the toilet seal.
2. The toilet seal of claim 1 wherein at least part of the collapsible body extends below at least part of the base after installation of the toilet on the toilet seal.
3. The toilet seal of claim 1 wherein at least part of the lower portion extends below at least part of the base after installation of the toilet on the toilet seal.
4. The toilet seal of claim 1 further comprising a lip extending radially outward from an upper end of the upper portion.
5. The toilet seal of claim 1 wherein the base extends radially outward from the lower portion.
6. The toilet seal of claim 3 wherein at least part of the lower portion is disposed below at least part of the base and into the aperture after installation of the toilet on the toilet seal.
7. The toilet seal of claim 3 wherein the lower portion comprises a first substantially frustoconical sidewall that narrows as it extends upwardly and the upper portion comprises a second substantially frustoconical sidewall that widens as it extends upwardly.
8. The toilet seal of claim 5 wherein the middle portion is narrower than the upper portion and narrower than the lower portion.
9. The toilet seal of claim 1 wherein the middle portion extends inwardly from the upper portion and the lower portion extends outwardly from the middle portion.
10. The toilet seal of claim 7 further comprising an inwardly extending shoulder disposed between the upper portion and the middle portion.
11. The toilet seal of claim 7 wherein the upper portion is wider than the middle portion and wider than the lower portion; and wherein the base is wider than the upper portion and wider than the lower portion.
12. The toilet seal of claim 1 wherein the collapsible body comprises a rubber material.
13. The toilet seal of claim 12 wherein the rubber material comprises one or more of neoprene, foam rubber, polyvinylchloride (PVC) rubber, thermoplastic elastomer (TPE), thermoplastic rubber (TPR), styrene-butadiene rubber (SBR), or ethylene propylene diene monomer (EPDM) rubber.
14. The toilet seal of claim 12 wherein the upper portion, the middle portion, and the lower portion are unitarily formed of the rubber material.

15. The toilet seal of claim 12 wherein the base and the collapsible body are unitarily formed of the rubber material.

16. The toilet seal of claim 1 further comprising a first edge disposed between the upper portion and the middle portion; a second edge disposed between the middle portion and the lower portion; and a third edge disposed between the lower portion and the base; wherein there is a first vertical distance between at least two of the first edge, the second edge, and the third edge prior to installation of the toilet on the toilet seal; wherein the first vertical distance is decreased after installation of the toilet on the toilet seal.

17. The toilet seal of claim 16 wherein the third edge is disposed below at least a portion of the base after installation of the toilet on the toilet seal.

18. The toilet seal of claim 1 further comprising a pipe extension extending downwardly from the base or from the lower portion of the collapsible body.

19. The toilet seal of claim 16 further comprising a pipe extension extending downwardly from the third edge.