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Standpipe for a warewashing machine

Abstract

A standpipe for a warewashing machine defining a drain aperture, the standpipe having an elongated tubular body having an open top end defined by a top edge and an open bottom end, and a cover portion including a base wall and a continuous sidewall extending downwardly from an outer perimeter of the base wall, wherein a bottom edge of the sidewall of the cover portion extends downwardly beyond the top edge of the elongated body.

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Background/Summary

CLAIM OF PRIORITY (1) This application claims priority to U.S. provisional application No. 63/318,271 filed on Mar. 9, 2022, the disclosure of which is incorporated by reference herein.

FIELD OF INVENTION

(1) The present invention relates generally to warewashing machines. More particularly, the present invention relates to warewashing machines including standpipe assemblies to prevent the unintentional loss of water during dishware cleaning operations.

BACKGROUND

(2) Warewashing machines perform cleaning and sanitizing cycles on dishware that may utilize water at high temperatures, e.g., up to 180° F. Regulations exist that put an upper limit of 140° F./60° C. on the temperature of wastewater that may be discharged into a building's drainage system. For example, Chapter 7, Section 701.7 of the 2018 International Plumbing Code provides that “wastewater when discharged into the building drainage system shall be at a temperature not higher than 140° F. (60° C.). When higher temperatures exist, approved cooling methods shall be provided.” Regulations dictate this upper limit on wastewater drainage because, when drained, wastewater initially flows down into traps provided in the building's drainage piping that are intended, among other things, to trap grease and prevent the grease from flowing down further into the drainage system, where it may solidify and cause blockages. If wastewater exceeding the defined limit is allowed to drain, and thus enter the traps, the wastewater can melt or dislodge the previously solidified grease from the traps, allowing the grease to flow downstream within the drainage system where it can re-solidify, possibly causing a blockage at a point that is not readily accessible. As well, various components, such as, but not limited to, piping, fittings, gaskets, etc., may be formed of materials, such as, but not limited to, polyvinylchloride (PVC), nylon, etc., that may be damaged by excessive heat. One of the approved cooling methods is the use of a drain water tempering system, as shown in FIG. **1**, to mix cold water with the hot wastewater as it drains from the warewashing machine.

(3) FIG. **1** provides a partial view of a warewashing machine **10** including an interior volume **12** in which dishwares **69** (FIG. **6**) to be cleaned are disposed, a hot water tank **16** that stores a volume of water **19** that is recirculated within the interior volume **12** by a recirculation pump **18** during

cleaning and sterilization operations, and a drain water tempering system **20** that connects the hot water tank **16** to the drainage system (not shown) of a building. Referring additionally to FIGS. **2**A and **2**B, a known drain water tempering system **20** includes a drain water fitting **22** and a drain tempering valve **24**. Drain water fitting **22** includes a substantially cylindrical body **21** defining an interior chamber **23**, a drain water inlet port **25** in fluid communication with a drain **17** on the bottom wall of hot water tank **16**, a cold water inlet port **27** that is in fluid communication with a cold water source (not shown) of the building as well as interior chamber **23** of drain water fitting **22**, and a drain water outlet port **29** that is in fluid communication with the drain system of the building.

(4) Referring specifically to FIG. **1**, in operation, a standpipe **30** has an open bottom end **32** that is seated within drain **17** of hot water tank **16** so that hot water accumulates within the hot water tank **16** until the level of hot water **19** reaches an open top end **34** of the standpipe **30**. Preferably, the volume of hot water **19** within hot water tank **16** is utilized for multiple cleaning cycles of multiple sets of dishware, for example, up to six to eight cleaning cycles, before the hot water is drained. As shown in FIG. **2**B, the used wastewater is drained from hot water tank **16** by moving standpipe **30** in an upward direction, such as by a lever or handle (not shown), thereby unseating open bottom end **32** of standpipe **30** from drain **17** of hot water tank **16**. As such, the wastewater disposed within hot water tank **16** is now free to drain into interior chamber **23** of drain water fitting **22**.

(5) Drain tempering valve **24** includes a temperature sensor **26** that extends inwardly into interior chamber **23** of the drain water fitting. Drain tempering valve **24** may be a mechanical valve including a bimetallic switch (not shown). The set point of the drain tempering valve's bimetallic switch is adjusted to desired threshold temperature, such as 160° F., so that when temperature sensor **26** is immersed in large amounts of draining wastewater (indicated by arrow **13**) that exceeds the set point, such as when a bottom end **32** of standpipe **30** is withdrawn from drain **17** of hot water tank **16**, as shown in FIG. **2**B, the bimetallic switch changes state, thereby causing drain tempering valve **24** to open so that cold water from the cold water source flows into interior chamber **23** of drain water fitting **22**. This mixes the cold water with the draining wastewater prior to the wastewater exiting drain water outlet port **29**, thereby lowering the temperature of the water exiting outlet port **29**. As long as the temperature of the wastewater within interior chamber **23** of drain water fitting **22** exceeds the valve's set point, the bimetallic switch will maintain drain tempering valve **24** in its open position. Once the temperature of the wastewater with interior chamber **23** no longer exceeds the set point, the bimetallic switch changes state, thereby closing the drain tempering valve **24** and securing the flow of cold water into the drain water fitting **22**.

(6) Often, commercial warewashing machines are designed such that their hot water tanks **16** are only required to be drained after multiple dishware cleaning cycles, for example six to eight cycles, which facilitates water conservation. Although known drain water tempering systems may function properly when the hot water tank is purposefully being drained, problems are known to exist during repeated cleaning cycles in which standpipe **30** remains in the seated position within drain **17**, as shown in FIG. **1**. Specifically, referring additionally to FIG. **2**A, during the repeated cleaning cycles of the dishware, small amounts of hot water (indicated by arrows **11**) can enter the open top end **34** of standpipe **30** and flow down the standpipe's inner surface into interior chamber **23** of drain water fitting **22**. The amount of hot water that passes through standpipe **30**, and the rate at which the hot water passes, is typically not great enough to cause the water to accumulate within drain water fitting **22**. Rather, the small amounts of hot wastewater drain continuously from drain water fitting **22** into the drainage system. Such hot water accumulation within interior chamber **23** is not great enough to submerge, or even make contact with, temperature sensor **26** of drain tempering valve **24**. As a result, drain tempering valve **24** remains in the closed position, and cold water is not mixed with the hot wastewater. The draining wastewater exits drain water fitting **22** at substantially the same temperature as that of the volume of hot water **19** that is stored within hot water tank **16**. As noted above, temperatures of up to 180° F. are often utilized during typical

cleaning and sanitizing operations, meaning known drain water tempering systems may allow wastewater drainage exceeding the threshold temperature set by regulations to enter the drainage system of the corresponding building.
(7) The present invention recognizes and addresses considerations of prior art constructions and methods.
SUMMARY
(8) An embodiment of the present disclosure provides a standpipe for a warewashing machine defining a drain aperture, the standpipe including an elongated tubular body having an open top end defined by a top edge and an open bottom end, and a cover portion including a base wall and a continuous sidewall extending downwardly from an outer perimeter of the base wall, wherein a bottom edge of the sidewall of the cover portion extends downwardly beyond the top edge of the elongated body.
(9) The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate one or more embodiments of the invention and, together with the description, serve to explain the principles of the invention.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended drawings, in which;
(2) FIG. **1** is a partial cross-sectional view of a warewashing machine including a prior art standpipe;
(3) FIGS. **2**A and **2**B are partial cross-sectional views of the warewashing machine and standpipe shown in FIG. **1**;
(4) FIG. **3** is a partial cross-sectional view of a warewashing machine including a standpipe in accordance with an embodiment of the present invention;
(5) FIGS. **4**A and **4**B are partial cross-sectional views of the warewashing machine shown in FIG. **3**;
(6) FIGS. **5**A, **5**B, and **5**C are side, cross-sectional, and partial cross-sectional views of the standpipe shown in FIGS. **4**A and **4**B; and
(7) FIG. **6** is a perspective view of a warewashing machine including the standpipe shown in FIGS. **5**A, **5**B, and **5**C.
(8) Repeat use of reference characters in the present specification and drawings is intended to represent same or analogous features or elements of the invention according to the disclosure.
DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS
(9) Reference will now be made in detail to presently preferred embodiments of the invention, one or more examples of which are illustrated in the accompanying drawings. Each example is provided by way of explanation, not limitation, of the invention. In fact, it will be apparent to those skilled in the art that modifications and variations can be made in the present invention without departing from the scope and spirit thereof. For instance, features illustrated or described as part of one embodiment may be used on another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.
(10) As used herein, terms referring to a direction or a position relative to the orientation of the warewashing machine, such as but not limited to “vertical,” “horizontal,” “top,” “bottom,” “above,” or “below,” refer to directions and relative positions with respect to the warewashing machine's orientation in its normal intended operation, as indicated in FIGS. **3** and **6**. Thus, for

instance, the terms “vertical” and “top” refer to the vertical orientation and relative upper position in the perspective of FIGS. **3** and **6** and should be understood in that context, even with respect to a warewashing machine that may be disposed in a different orientation.

(11) Further, the term “or” as used in this application and the appended claims is intended to mean an inclusive “or” rather than an exclusive “or.” That is, unless specified otherwise, or clear from the context, the phrase “X employs A or B” is intended to mean any of the natural inclusive permutations. That is, the phrase “X employs A or B” is satisfied by any of the following instances: X employs A; X employs B; or X employs both A and B. In addition, the articles “a” and “an” as used in this application and the appended claims should generally be construed to mean “one or more” unless specified otherwise or clear from the context to be directed to a singular form. Throughout the specification and claims, the following terms take at least the meanings explicitly associated herein, unless the context dictates otherwise. The meanings identified below do not necessarily limit the terms, but merely provide illustrative examples for the terms. The meaning of “a,” “and,” and “the” may include plural references, and the meaning of “in” may include “in” and “on.” The phrase “in one embodiment,” as used herein, does not necessarily refer to the same embodiment, although it may.

(12) Referring now to the figures, specifically FIGS. **3** and **5**A through **5**C, a warewashing machine **10** including a standpipe **100** in accordance with an embodiment of the present disclosure is shown. Preferably, the standpipe **100** includes an elongated body **102** formed by a cylindrical tube having an open bottom end **104** that is defined by a frustoconical end wall **106**. The outer surface of the frustoconical end wall **106** forms a water-tight seal with the drain **17** when the bottom end **104** of the standpipe **100** is received therein, as shown in FIG. **3**. Note, in alternate embodiments, the elongated body **102** of the standpipe **100** may be formed by a tubular body of a cross-section other than circular.

(13) As best seen in FIGS. **4**B and **5**C, rather than an open top end **34** (FIG. **1**) as in existing standpipes **30**, the disclosed standpipe **100** includes a cover portion **110** affixed to the top end **112** of the elongated body **102**. Preferably, the cover portion **110** includes a circular base wall **114** that is fixed to the top end **112** of the elongated body **102**, and a cylindrical sidewall **116** that extends downwardly from the circular outer perimeter of the base wall **114**, thereby forming an annular gap **118** between the sidewall of the elongated body **102** and the bottom edge **120** of the sidewall **116** of the cover portion **110**. As shown, the bottom edge **121** of the cover's sidewall **120** extends downwardly beyond the top edge **103** of the elongated body **102**. This axial overlap **126** of the cover portion **110** with regard to the top end **12** of the elongated body **102** allows the cover portion **110** to prevent hot water being used to clean dishwares from entering the elongated body **102** of the drain due to turbulent flow within the warewashing machine **10**. Note, however, the cover portion **110** is fixed to the elongated body **102** of the standpipe **100** by a plurality of posts **130** defining drain apertures **132** therebetween. As such, should the volume of hot water in the warewashing machine exceed the height of the top edge **103** of the elongated body **102**, the cover portion **110** allows hot water to enter the standpipe **100**, thereby passing through the drain **117** and preventing an overflow condition.

(14) Referring additionally to FIG. **6**, the operation of a warewashing machine **40** including the standpipe **100** shown in FIGS. **5**A through **5**C is discussed. With regard to the illustrated example, an operator initially places a rack **61** with dishware **69** into the interior volume **65** of warewashing machine **40**. Warewashing machine **40** has a housing **37** that defines interior volume **27** a front opening thereof, and that includes a door **29**. A water source, e.g., a municipal water supply, is indicated by an input water line at **43**. A pump (not shown) draws water from water source **43** and drives the water into a hot water tank **16** that includes a heating unit, the hot water tank being disposed in the lower part of housing **37**. A recirculation pump **18** forces the heated water up to an agitation unit **47** having a plurality of arms **13** (only two of which are indicated in FIG. **6**) that rotate about a vertical axis while spraying pressurized water upward therefrom. Upon the return of

door **29** to its upright position and the user's actuation of warewashing machine **40**, the machine's control circuitry applies electrical power to the heating unit to heat the incoming water from source **43** at up to approximately 180° F. or another predetermined temperature level, e.g. approximately 160° F. or 165° F., and recirculation pump **18** pumps the heated water to agitation unit **47**/**13**, which sprays the heated water upward through apertures in rotating spray arms **13**, thereby cleaning and sanitizing the dishware, as should be understood. Upon completion of the sanitization and cleaning operations on dishware **69**, the operator removes rack **61** from the warewashing machine **40** such that another cleaning operation of dishware disposed in another rack may be performed. As previously noted, multiple cleaning operations are preferably performed utilizing substantially the same water that is initially received within hot water tank **16**.

(15) Referring additionally to FIGS. **3** and **5**C, in operation, the open bottom end **102** of the standpipe **100** is seated within drain **17** of hot water tank **16** so that hot water accumulates within the hot water tank **16** until the level of hot water **19** reaches the top edge **103** of the elongated body **102** of the standpipe **100**. Preferably, the volume of hot water **19** within hot water tank **16** is utilized for multiple cleaning cycles of multiple sets of dishware, for example, up to six to eight cleaning cycles, before the hot water is drained. Similarly to FIG. **2**B, the used wastewater is drained from hot water tank **16** by moving standpipe **100** in an upward direction, such as by a lever or handle (not shown), thereby unseating open bottom end **102** of standpipe **100** from drain **17** of hot water tank **16**. As such, the wastewater disposed within hot water tank **16** is now free to flow into the drain system. As previously noted, existing drain tempering systems **50** are known to function properly when adequate amounts of hot wastewater are purposefully drained from warewashing machines.

(16) As previously discussed, commercial warewashing machines are often designed so that their hot water tanks **16** are only drained after multiple dishware cleaning cycles, for example six to eight cycles. Referring specifically to FIGS. **1** and **2**A, during the repeated cleaning cycles of warewashing machines **10** having prior art standpipe **30**, hot water (indicated by arrows **11**) may enter the open top end **34** of standpipe **30** and flow down the inner surface of standpipe **30** into interior chamber **53** of drain water fitting **52**. Unlike the previously discussed prior art standpipes **30**, such as that shown in FIG. **1**, in which turbulent flow within a warewashing machine allows hot water (indicated by arrows **11**) to drain continuously from the machine. The cover portion **110** of the disclosed standpipe **100** only allows hot water to drain when the level of the water exceeds the height of the top edge **103**, or when the user withdraws the standpipe **100** from the drain. Specifically, the sidewall **120** of the cover portion **110** extends downwardly beyond the top edge **103**, thereby preventing any hot water due to turbulent flow from entering. Rather, the height of the hot water must rise above both the bottom edge **121** of the cover portion's sidewall **120** and the top edge **103** of the standpipe's elongated body **102** so that the hot water may pass through the annular gap **118** defined therebetween and enter the standpipe **100** through the drain apertures **132**. In short, the axial overlap **126** between the concentric sidewalls of the top end **112** of the elongated body **102** and the bottom end of the cover portion **110** prevent the turbulent flow of water from splashing into the open top end **112** of the standpipe **100**.

(17) While one or more preferred embodiments of the invention are described above, it should be appreciated by those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope and spirit thereof. It is intended that the present invention cover such modifications and variations as come within the scope and spirit of the appended claims and their equivalents.

Claims

1. A standpipe for a warewashing machine defining a drain aperture, the standpipe comprising: an elongated tubular body having an open top end defined by a top edge and an open bottom end; and

a cover portion including a base wall and a continuous sidewall extending downwardly from an outer perimeter of the base wall, wherein the cover portion axially overlaps the top end of the elongated tubular body such that a bottom edge of the sidewall of the cover portion extends downwardly beyond the top edge of the elongated body and defines a gap between the sidewall of the cover portion and the elongated tubular body through which fluid can flow from an exterior of the cover portion into the top end of the elongated tubular body.

2. The standpipe of claim 1, wherein the sidewall of the cover portion and the tubular body are both cylindrical and the sidewall of the cover portion is concentric to the tubular body.

3. The standpipe of claim 2, wherein the gap is an annular recess defined between the bottom edge of the sidewall of the cover portion and the open top end of the tubular body.

4. The standpipe of claim 1, wherein the open bottom end of the tubular body is defined by a frustoconical sidewall.

5. A standpipe for a warewashing machine, the warewashing machine including a hot water tank defining a drain aperture, the standpipe comprising: an elongated body having a first open end defining a first edge and a second open end opposite the first open end, wherein the second open end is configured to be removably seated in the drain aperture of the hot water tank of the warewashing machine; a cover portion coupled with the elongated body and disposed over the first open end, the cover portion defining a base wall and a sidewall extending about the base wall, the sidewall defining a cover portion open end opposite the base wall; wherein the first edge of the first open end of the elongated body is located interior of the sidewall of the cover portion and a gap is defined between the first open end and the sidewall; wherein the gap is in fluid communication with the cover portion open end such that fluid exterior of the cover portion can flow through the cover portion open end, through the gap, and into the first open end of the elongated body.

6. The standpipe of claim 5, wherein the base wall of the cover portion is fixed to the first edge of the of the elongated body by a plurality of posts, the plurality of posts defining a plurality of drain openings therebetween.

7. The standpipe of claim 5, wherein the first open end of the elongated body is concentric with the sidewall of the cover portion.

8. The standpipe of claim 5, wherein the gap is annular in shape.

9. The standpipe of claim 5, wherein, when the second open end is removably seated in the drain aperture of the hot water tank of the warewashing machine and the hot water tank is filled with water, a surface level of the water is above the sidewall open end and below the first open end of the elongated body.

10. A standpipe for a warewashing machine, the warewashing machine including a hot water tank defining a drain aperture, the standpipe comprising: a tubular elongated body having a proximal end configured for engagement with the drain aperture of the water tank of the warewashing machine and a distal end opposite the proximal end, wherein the proximal end defines a proximal end opening that is in fluid communication with a distal end opening located at the distal end; a cover located at the distal end of the elongated body, the cover comprising a first wall and a sidewall depending from a periphery of the first wall, wherein the first wall is coupled with the distal end of the elongated body and wherein the sidewall defines cover opening opposite the first wall; wherein the cover opening is located proximal of the distal end opening and wherein the sidewall is spaced apart from the distal end of the elongated body to define a fluid path extending from an exterior of the cover, between the distal end of the elongated body and the sidewall, through the distal end opening, and to the proximal end opening.

11. The standpipe of claim 10, wherein the first wall is circular in shape.

12. The standpipe of claim 10, wherein when the proximal end is engaged with the drain aperture of the hot water tank of the warewashing machine and the hot water tank is filled with water, the distal end opening is above a surface level of the water and the cover opening is below a surface level of the water.

13. The standpipe of claim 10, further comprising a plurality of drain openings disposed between the first wall and the distal end of the elongated body.
14. The standpipe of claim 10, wherein the cover further comprises a second wall opposite the first wall and distal thereof, and wherein the sidewall extends between the first wall and the second wall.
15. The standpipe of claim 10, wherein the cover is configured to engage a lever or handle operable to raise the elongated body relative to the drain aperture of the hot water tank.