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SYSTEM FOR MITIGATING BACKLASH OF A CONTROL KNOB

Abstract

A cooking appliance may define a vertical direction, a lateral direction, and a transverse direction. The cooking appliance may include a heating element. The cooking appliance may further include a control valve assembly associated with the heating element. The control valve assembly may include a valve shaft. The valve shaft may include a cylindrical arm defining a first end and a second end. The cylindrical arm may include a tang extended from the first end. The control valve assembly may further include a valve cap. The valve cap may include a circumferential shelf therewithin. The circumferential shelf may include a first pedestal and a second pedestal that together define a wedge slot for receiving the tang. The first pedestal may include an angled pedestal wall.

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Background/Summary

FIELD OF THE DISCLOSURE

[0001] The present subject matter relates generally to a control knob, and more particularly, to a control knob for a cooking appliance.

BACKGROUND OF THE DISCLOSURE

[0002] Gas cooktops generally include a plurality of gas burners for heating cooking utensils and food items within the cooking utensils. Certain gas cooktops include manual control valves that allow a user of the gas cooktops to adjust or regulate operation of the gas burners. For example, turning a control knob attached to a shaft of the manual control valve in a first direction increases gas fuel flow to the gas burner and thereby increases a heat output of the associated gas burner. Conversely, turning the knob of the manual control valve in a second, opposite direction decreases gas fuel flow to the gas burner and thereby decreases a heat output of the associated gas burner.

[0003] In some instances, control knobs for gas cooktops can have excessive rotary backlash, or free rotation, of the control knob. Excessive rotary backlash of the control knob can often be caused by the fitment between various components of the manual control valve. For example, the shaft of the manual control valve may be coupled to a valve cap of the manual control valve. Any looseness in fit between the shaft and the valve cap can be amplified and result in excessive rotary backlash of the control knob.

[0004] Accordingly, a system that obviates one or more of the above drawbacks would be useful.

BRIEF DESCRIPTION OF THE DISCLOSURE

[0005] Aspects and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned through practice of the invention.

[0006] In one exemplary aspect of the present disclosure, a cooking appliance is provided. The cooking appliance may define a vertical direction, a lateral direction, and a transverse direction. The cooking appliance may include a heating element. The cooking appliance may also include a control valve assembly associated with the heating element. The control valve assembly may include a valve shaft. The valve shaft may include a cylindrical arm defining a first end and a second end. The cylindrical arm may include a tang extended from the first end. The control valve assembly may also include a valve cap including a circumferential shelf therewithin. The circumferential shelf may include a first pedestal and a second pedestal that together define a wedge slot for receiving the tang. The first pedestal may include an angled pedestal wall.

[0007] In another exemplary aspect of the present disclosure, a control valve assembly for a gas burner is provided. The control valve assembly may define a vertical direction, a lateral direction, and a transverse direction. The control valve assembly may include a valve shaft including a cylindrical arm defining a first end and a second end. The cylindrical arm may include a tang extended from the first end. The control valve assembly may also include a stepped valve cap including a circumferential shelf therewithin. The circumferential shelf may include a first pedestal and a second pedestal spaced circumferentially apart that define a wedge slot for receiving the tang. The first pedestal may include an angled pedestal wall. The first pedestal may define a first extension. The second pedestal may define a second extension. The first extension may be greater than the second extension.

[0008] In yet another exemplary aspect of the present disclosure, a control valve assembly for a gas burner is provided. The control valve assembly may define a vertical direction, a lateral direction, and a transverse direction. The control valve assembly may include a valve shaft including a cylindrical arm defining a first end and a second end. The cylindrical arm may include a tang extended from the first end. The control valve assembly may also include a stepped valve cap including a circumferential shelf therewithin. The circumferential shelf may include a first pedestal and a second pedestal spaced circumferentially apart that define a wedge slot for receiving the tang. The second pedestal may include an angled pedestal wall. The first pedestal may define a first

extension. The second pedestal may define a second extension. The first extension may be greater than the second extension.
[0009] These and other features, aspects and advantages of the present invention will become better understood with reference to the following description and appended claims. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0010] 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 figures.
[0011] FIG. **1** provides a front, perspective view of a cooking appliance according to one or more exemplary aspects of the present subject matter.
[0012] FIG. **2** provides a top, plan view of the exemplary cooking appliance of FIG. **1**.
[0013] FIG. **3**, provides a perspective view of a control valve assembly according to one or more exemplary aspects of the present subject matter.
[0014] FIG. **4** provides an exploded view of the control valve assembly of FIG. **3**.
[0015] FIG. **5** provides a perspective view of a valve cap according to one or more exemplary aspects of the present subject matter.
[0016] FIG. **6** provides a perspective view of a valve cap and a valve stem according to one or more exemplary aspects of the present subject matter.
[0017] FIG. **7** provides a cross-sectional view of a slot of a valve cap and a tang of a valve stem according to one or more exemplary aspects of the present subject matter.
[0018] FIG. **8** provides a cross-sectional view of an alternative slot of a valve cap and a tang of a valve stem according to one or more exemplary aspects of the present subject matter.
[0019] Repeat use of reference characters in the present specification and drawings is intended to represent the same or analogous features or elements of the present invention.
DETAILED DESCRIPTION
[0020] Reference now will be made in detail to embodiments of the invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope of the invention. For instance, features illustrated or described as part of one embodiment can be used with 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.
[0021] As used herein, the term “or” is generally intended to be inclusive (i.e., “A or B” is intended to mean “A or B or both”). The terms “first,” “second,” and “third” may be used interchangeably to distinguish one component from another and are not intended to signify location or importance of the individual components. The terms “upstream” and “downstream” refer to the relative flow direction with respect to fluid flow in a fluid pathway. For example, “upstream” refers to the flow direction from which the fluid flows, and “downstream” refers to the flow direction to which the fluid flows.
[0022] Exemplary aspects of the present subject matter are directed to systems for preventing, restricting, or mitigating rotary backlash for a control knob of a cooking appliance, such as when the control knob is in an off position. Typically, a control valve assembly is associated with the

control knob. The control valve assembly can include a valve body, a valve shaft, a valve cone, and a valve cap. The valve cap may be mounted to the valve body to hold the valve cone within the valve body. Additionally, the valve shaft can extend through the valve cap and be coupled to the control knob. In exemplary embodiments of the present subject matter the valve cap can define a slot configured to receive a tang extended from the valve shaft. Specifically, embodiments of the present subject matter advantageously provide a wedged-shaped tang and a complementary wedge-shaped slot that together mitigate rotary backlash of the associated control knob. Moreover, the wedged-shaped tang and the complementary wedged-shaped slot may be configured to maintain push to turn forces of the control knob. In this regard, a user may be prevented from turning the knob prior to pushing it in.

[0023] Turning now to the figures, FIG. **1** provides a front, perspective view of a cooking appliance **100** as may be employed with the present disclosure. FIG. **2** provides a top, plan view of cooking appliance **100**. Cooking appliance **100** includes an insulated cabinet **110**. Cabinet **110** defines an upper cooking chamber **120** and a lower cooking chamber **122**. Thus, cooking appliance **100** is generally referred to as a double oven cooking appliance. As will be understood by those skilled in the art, cooking appliance **100** is provided by way of example only, and the present disclosure may be used in any suitable appliance (e.g., a single oven cooking appliance, an electric cooking appliance, or a standalone cooktop appliance). Thus, the exemplary embodiment shown in FIG. **1** is not intended to limit the present disclosure to any particular cooking chamber configuration or arrangement.

[0024] Upper and lower cooking chambers **120** and **122** are configured for the receipt of one or more food items to be cooked. Cooking appliance **100** includes an upper door **124** and a lower door **126** rotatably attached to cabinet **110** in order to permit selective access to upper cooking chamber **120** and lower cooking chamber **122**, respectively. Handles **128** are mounted to upper and lower doors **124** and **126** to assist a user with opening and closing doors **124** and **126** in order to access cooking chambers **120** and **122**. As an example, a user can pull on handle **128** mounted to upper door **124** to open or close upper door **124** and access upper cooking chamber **120**. Glass windowpanes **130** provide for viewing the contents of upper and lower cooking chambers **120** and **122** when doors **124** and **126** are closed and also assist with insulating upper and lower cooking chambers **120** and **122**. Heating elements (not shown), such as electric resistance heating elements, gas burners, microwave heating elements, halogen heating elements, or suitable combinations thereof, are positioned within upper cooking chamber **120** and lower cooking chamber **122** for heating upper cooking chamber **120** and lower cooking chamber **122**.

[0025] Cooking appliance **100** also includes a cooktop **140**. Cooktop **140** is positioned at or adjacent a top portion of cabinet **110**. Thus, cooktop **140** is positioned above upper and lower cooking chambers **120** and **122**. Cooktop **140** includes a top panel **142**. By way of example, top panel **142** may be constructed of glass, ceramics, enameled steel, and combinations thereof. Moreover, top panel **142** may be formed as a unitary, single piece or, alternatively, as multiple discrete pieces joined together.

[0026] For cooking appliance **100**, a utensil holding food or cooking liquids (e.g., oil, water, etc.) may be placed onto grates **152** at a location of any of burner assemblies **144**, **146**, **148**, **150**. Burner assemblies **144**, **146**, **148**, **150** provide thermal energy to cooking utensils on grates **152**. As shown in FIG. **1**, burners assemblies **144**, **146**, **148**, **150** can be configured in various sizes so as to provide, for example, for the receipt of cooking utensils (e.g., pots, pans, etc.) of various sizes and configurations and to provide different heat inputs for such cooking utensils. Grates **152** may be supported on a top surface **158** of top panel **142**. In optional embodiments, cooking appliance **100** includes a griddle burner **160** positioned at a middle portion of top panel **142**, as may be seen in FIG. **2**. A griddle may be positioned on grates **152** and heated with griddle burner **160**.

[0027] A user interface panel **154** is located within convenient reach of a user of the cooking appliance **100**. For this exemplary embodiment, user interface panel **154** includes control knobs

156 that are each associated with one of burner assemblies **144**, **146**, **148**, **150** and griddle burner **160**. Control knobs **156** allow the user to activate each burner assembly and determine the amount of heat input provided by each burner assembly **144**, **146**, **148**, **150** and griddle burner **160** to a cooking utensil located thereon. User interface panel **154** may also be provided with one or more graphical display devices that deliver certain information to the user such as, for example, whether a particular burner assembly is activated or the rate at which the burner assembly is set.

[0028] Although shown with control knobs **156**, it should be understood that control knobs **156** and the configuration of cooking appliance **100** shown in FIG. **1** is provided by way of example only. More specifically, user interface panel **154** may include various input components, such as one or more of a variety of touch-type controls, electrical, mechanical or electro-mechanical input devices including rotary dials, push buttons, and touch pads. The user interface panel **154** may include other display components, such as a digital or analog display device designed to provide operational feedback to a user.

[0029] Referring now to FIGS. **3** through **7**, a control valve assembly **200** and components thereof are provided according to one or more exemplary embodiments of the present subject matter. Generally, the control valve assembly **200** may be used in cooking appliance **100** to regulate gas fuel flow to one or more of the burner assemblies **144**, **146**, **148**, **150** or griddle burner **160**. For instance, each one of the burner assemblies **144**, **146**, **148**, **150** or griddle burner **160** may be associated with a discrete control valve assembly **200** to regulate gas fuel flow. Moreover, the control valve assembly **200** may be coupled to a control knob **156** associated with the burner assemblies **144**, **146**, **148**, **150** or griddle burner **160**. In this regard, a user of the cooking appliance **100** can rotate the control knob **156** to regulate gas fuel flow, as will be discussed in more detail below.

[0030] The control valve assembly **200** may define a vertical direction H, a lateral direction W, and a transverse direction D. It should be noted that the coordinates defined herein apply to control valve assembly **200** and may or may not be equivalent to the vertical direction V, lateral direction L, and transverse direction T defined by cooking appliance **100**. In some instances, the control valve assembly **200** may be positioned within cooking appliance **100** in a tilted manner, such that vertical direction H of the control valve assembly **200** is provided at an acute angle with respect to the vertical direction V of cooking appliance **100**.

[0031] The control valve assembly **200** may generally include a valve body **202**, a valve cone **204** (e.g., FIG. **4**), a valve shaft **206**, and a stepped valve cap **208**. In some embodiments, the valve body **202** defines an inlet conduit **210**, a valve chamber **212** (e.g., FIG. **4**), and an outlet conduit **214**. The inlet conduit **210** may be configured for receiving a flow of gaseous fuel and directing the flow of gaseous fuel into the valve chamber **212** defined by the valve body **202**. From the valve chamber **212**, the flow of gaseous fuel can exit the valve body **202** at the outlet conduit **214**. The outlet conduit **214** may be engaged with a gas fuel line of one of the burner assemblies **144**, **146**, **148**, **150** or griddle burner **160**.

[0032] A flow rate of the gaseous fuel through the valve chamber **212** may be regulated with the valve cone **204**. For instance, the valve cone **204** may be positioned within valve chamber **212** to regulate gaseous fuel flow through the valve chamber **212**. In particular, a cross-sectional area of valve cone **204** in a plane that is perpendicular to the lateral direction W may correspond to or match (e.g., be slightly less than) a cross-sectional area of valve chamber **212** in the plane that is perpendicular to the lateral direction W. Thus, gas fuel flowing into valve chamber **212** may flow through valve cone **204** to outlet conduit **214** of valve body **202** rather than around valve cone **204** within valve chamber **212** of valve body **202**.

[0033] Valve cone **204** is configured to rotate within valve chamber **212** of valve body **202**. Rotation of valve cone **204** within valve chamber **212** adjusts a position of slot **216** of valve cone **204** relative to inlet conduit **210**. In such a manner, the flow of gaseous fuel through control valve assembly **200** is regulated or controlled. In particular, more gaseous fuel may flow through valve

body **202** when slot **216** of valve cone **204** is aligned with inlet conduit **210** of valve body **202**. Conversely, less gaseous fuel may flow through valve body **202** when slot **216** of valve cone **204** is not aligned with inlet conduit **210** of valve body **202**, e.g., such as when other portions of slot **216** are aligned with inlet conduit **210** of valve body **202**.

[0034] Further, the valve body **202** may include a mounting bracket **252** mounted thereto. The mounting bracket **252** may be integrally formed with valve body **202** such that mounting bracket **252** and valve body **202** are formed of a single continuous piece of material, such as a metal or plastic. Mounting bracket **252** is configured for receiving and coupling to a gaseous fuel manifold, such as steel tubing. To assist with securing the gaseous fuel manifold to mounting bracket **252**, mounting bracket **252** defines a fastener hole **254**. A fastener may extend into fastener hole **254** to or into the gaseous fuel manifold. Thus, fastener may engage mounting bracket **252** and the gaseous fuel manifold in order to secure the gaseous fuel manifold to mounting bracket **252**.

[0035] The valve shaft **206** may include a cylindrical arm **218** and a valve stem **220**. The cylindrical arm **218** may define a first end **222** and a second end **224** spaced apart approximately along the vertical direction H. A tang **226** may be extended from the first end **222** of the cylindrical arm **218**. The tang **226** may include a first body **228** and a second body **230**. The first body **228** being extended outward from an outer wall **232** of the cylindrical arm **218** approximately along a first direction (e.g., the lateral direction W). The second body **230** extended from the first body **228** approximately along a second direction (e.g., the vertical direction H). The first direction may be approximately perpendicular to the second direction such that the first body **228** and the second body **230** may form a right angle. Furthermore, the first body **228** and the second body **230** of the tang **226** may together form a first angled side **234** and a second side **236** (e.g., FIG. **7**). In this regard, the first body **228** and the second body **230** may together form a wedge-shaped end **229** for the tang **226** (e.g., FIG. **7**). As will be appreciated in more detail below, the wedge-shaped end **229** of the tang **226** may advantageously help prevent, restrict, or mitigate rotary backlash, or free rotation, of a control knob (e.g., control knob **156**) in an off position.

[0036] The valve stem **220** may be extended from the second end **224** of the cylindrical arm **218**. The valve stem **220** may be coupled to a respective control knob **156**. A user may rotate the valve stem **220** (e.g., indirectly via manipulation of the control knob **156**) in order to rotate the valve cone **204** within the valve chamber **212** defined by the valve body **202**. In this regard, a user may regulate a flow of gaseous fuel to an associated burner assembly, e.g., as discussed in more detail above.

[0037] The stepped valve cap **208** may generally include an outer wall **238** and an inner wall **240**. The inner wall **240** may include a circumferential shelf **242** that forms a surface for the wedge-shaped end **229** of the tang **226** to interface with. For instance, the circumferential shelf **242** may include a first pedestal **244** and a second pedestal **246** that together define a wedge slot **250** for receiving the wedge-shaped end **229** of the tang **226**. The first pedestal **244** may define a first extension **248** and the second pedestal **246** may define a second extension **251**. In some embodiments, the first extension **248** is measured from a top surface **243** of the first pedestal **244** to a bottom surface **245** of the wedge slot **250**. Further, in some embodiments, the second extension **251** is measured from a top surface **247** of the second pedestal **246** to the bottom surface **245** of the wedge slot **250**. In some embodiments the first extension **248** defined by the first pedestal **244** is greater than the second extension **251** defined by the second pedestal **246**. For example, the first extension **248** may be at least approximately one and a half times greater than the second extension **251**, such as approximately two times greater, such as approximately three times greater.

[0038] Further, the first pedestal **244** may include an angled pedestal wall **253**. The angled pedestal wall **253** may include an angled surface that may complement the wedge-shaped end **229** of the tang **226**. In some embodiments, the angled pedestal wall **253** may be defined by a predetermined angle **256** (see e.g., FIG. **7**). The predetermined angle **256** may be any suitable angle that may facilitate an interference fit or friction fit between the wedge-shaped end **229** of the tang **226** and

the wedge slot **250**. For example, the predetermined angle **256** may be approximately twenty degrees (20°) to approximately forty-five degrees (45°) relative to the vertical direction H.
[0039] In some embodiments, the control knob **156** utilizes a push to turn feature. The push to turn feature may require a user to push the control knob **156** in (e.g., toward the user interface panel **154**) prior to rotating or turning the control knob **156** (e.g., to regulate the gas fuel flow). When the control knob **156** is in the off position (e.g., prior to the control knob **156** being rotated) the tang **226** may be positioned within the wedge slot **250**. For instance, the first angled side **234** of the tang **226** may advantageously be interfaced with the angled pedestal wall **253** of the first pedestal **244** and the second side **236** of the tang **226** may be interfaced with a first wall **261** of the second pedestal **246** prior to the tang **226** being interfaced with the bottom surface **245** of the wedge slot **250**. In this regard, the tang **226** may advantageously form a friction fit with the angled pedestal wall **253** of the first pedestal **244** and the first wall **261** of the second pedestal **246**. Further, when the tang **226** is positioned within the wedge slot **250**, e.g., as illustrated in FIG. **7**, the friction fits between the tang **226**, the first pedestal **244**, or the second pedestal **246** may advantageously "wedge" the tang **226** within the wedge slot **250**. As a result rotary backlash of the control knob **156** in the off position may be prevented or mitigated as the tang **226** may be secured within the wedge slot **250**.
[0040] Furthermore, the predetermined angle **256** may be configured such that suitable push to turn forces may be maintained. For example, the predetermined angle **256** may configured such that the tang **226** does not "stick" within the wedge slot **250** when a push to turn force is applied to the control knob **156**. In this regard, the predetermined angle **256** may still allow a user to push in the control knob with a suitable amount of force that may be known to one of ordinary skill in the art.
[0041] Further, when the control knob **156** is pushed in, the tang **226** may become free from the wedge slot **250**. Once the tang **226** is free from the wedge slot **250**, the control knob **156**, and in turn, valve shaft **206** may be capable of rotating (e.g., rotating clockwise) to regulate the gas fuel flow as described in more detail above.
[0042] Alternatively, in some embodiments, the second pedestal **246** may include an angled pedestal wall. For example, referring now to FIG. **8**, a schematic view of a portion of a controller valve assembly **300** according to one or more exemplary aspects of the present disclosure is provided. The exemplary control valve assembly **300** of FIG. **8** may be configured in substantially the same manner as the exemplary control valve assembly **200** of FIG. **7**, and accordingly, the same or similar numbers may refer to the same or similar parts.
[0043] For example, the exemplary control valve assembly **300** of FIG. **8** generally includes a stepped valve cap **208** that includes circumferential shelf **242**. The circumferential shelf **242** of FIG. **8** generally includes a first pedestal **244** and a second pedestal **246** that are spaced circumferentially apart to define a wedge slot **250**. The first pedestal **244** may define a first extension **248** and the second pedestal **246** may define a second extension **251**. In some embodiments, the first extension **248** is measured from a top surface **243** of the first pedestal **244** to a bottom surface **245** of the wedge slot **250**. Further, in some embodiments, the second extension **251** is measured from a top surface **247** of the second pedestal **246** to the bottom surface **245** of the wedge slot **250**. In addition, the control valve assembly **300** of FIG. **8** includes a valve shaft **206** and a tang **226** extended from a first end **222** of the valve shaft **206**.
[0044] However, for the embodiment of FIG. **8**, the second pedestal **246** may include an angled pedestal wall **353**. Additionally, for the embodiment of FIG. **8**, the tang **226** may include a first side **334** and an angled second side **336**. The angled pedestal wall **353** may include an angled surface that may complement a wedge-shaped end **329** of the tang **226**. In some embodiments, the angled pedestal wall **353** may be defined by a predetermined angle **356**. The predetermined angle **356** may be any suitable angle that may facilitate an interference fit or friction fit between the wedge-shaped end of the tang **226** and the wedge slot **250**. For example, the predetermined angle **256** may be approximately ten degrees (10°) to approximately thirty degrees (30°) to the vertical direction H.

Moreover, the predetermined angle **256** may be configured such that suitable push to turn forces may be maintained. That is, the predetermined angle **356** may still allow a user to push in the control knob with a suitable amount of force.

[0045] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they include structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

Claims

1. A cooking appliance defining a vertical direction, a lateral direction, and a transverse direction, the cooking appliance comprising: a heating element; a control valve assembly associated with the heating element, the control valve assembly comprising: a valve shaft comprising a cylindrical arm defining a first end and a second end, the cylindrical arm comprising a tang extended from the first end; and a valve cap comprising a circumferential shelf therewithin, the circumferential shelf comprising a first pedestal and a second pedestal that together define a wedge slot for receiving the tang, the first pedestal comprising an angled pedestal wall.

2. The cooking appliance of claim 1, wherein the tang comprises a first body and a second body, wherein the first body is extended from an outer wall of the cylindrical arm in a first direction, wherein the second body is extended from the first body in a second direction, and wherein the second direction is approximately perpendicular to the first direction.

3. The cooking appliance of claim 2, wherein the first body and the second body together form a first angled side and a second side.

4. The cooking appliance of claim 3, wherein the first angled side is interfaced with the angled pedestal wall when the control valve assembly is in an off position to mitigate rotary backlash of the control valve assembly in the off position.

5. The cooking appliance of claim 1, wherein the first pedestal defines a first extension from a bottom surface of the wedge slot to a top surface of the first pedestal, wherein the second pedestal defines a second extension from the bottom surface of the wedge slot to the top surface of the pedestal wall, and wherein the first extension is greater than the second extension.

6. The cooking appliance of claim 1, wherein the angled pedestal wall of the first pedestal is defined by a predetermined angle of approximately twenty degrees to approximately forty-five degrees relative to the vertical direction.

7. The cooking appliance of claim 1, wherein the valve shaft further comprises a valve stem, wherein the valve stem is extended from the second end of the cylindrical arm, and wherein the valve stem is coupled to a control knob of the cooking appliance.

8. A control valve assembly for a gas burner, the control valve assembly defining a vertical direction, a lateral direction, and a transverse direction, the control valve assembly comprising: a valve shaft comprising a cylindrical arm defining a first end and a second end, the cylindrical arm comprising a tang extended from the first end; and a stepped valve cap comprising a circumferential shelf therewithin, the circumferential shelf comprising a first pedestal and a second pedestal spaced circumferentially apart that define a wedge slot for receiving the tang, the first pedestal comprising an angled pedestal wall, wherein the first pedestal defines a first extension, wherein the second pedestal defines a second extension, and wherein the first extension is greater than the second extension.

9. The control valve assembly of claim 8, wherein the tang comprises a first body and a second

body, wherein the first body is extended from an outer wall of the cylindrical arm in a first direction, and wherein the second body is extended from the first body in a second direction, and wherein the second direction is approximately perpendicular to the first direction.

10. The control valve assembly of claim 9, wherein the first body and the second body together form a first angled side and a second side.

11. The control valve assembly of claim 10, wherein the first angled side is interfaced with the angled pedestal wall when the control valve assembly is in an off position to mitigate rotary backlash of the control valve assembly in the off position.

12. The control valve assembly of claim 8, wherein the first extension is measured from a bottom surface of the wedge slot to a top surface of the first pedestal, and wherein the second extension is measured from the bottom surface of the wedge slot to the top surface of the pedestal wall.

13. The control valve assembly of claim 8, wherein the angled pedestal wall is defined a predetermined angle of approximately twenty degrees to approximately forty-five degrees relative to the vertical direction.

14. The control valve assembly of claim 8, wherein the valve shaft further comprises a valve stem, and wherein the valve stem is extended from the second end of the cylindrical arm.

15. A control valve assembly for a gas burner, the control valve assembly defining a vertical direction, a lateral direction, and a transverse direction, the control valve assembly comprising: a valve shaft comprising a cylindrical arm defining a first end and a second end, the cylindrical arm comprising a tang extended from the first end; and a stepped valve cap comprising a circumferential shelf therewithin, the circumferential shelf comprising a first pedestal and a second pedestal spaced circumferentially apart that define a wedge slot for receiving the tang, the second pedestal comprising an angled pedestal wall, wherein the first pedestal defines a first extension, wherein the second pedestal defines a second extension, and wherein the first extension is greater than the second extension.

16. The control valve assembly of claim 15, wherein the tang comprises a first body and a second body, wherein the first body is extended from an outer wall of the cylindrical arm in a first direction, and wherein the second body is extended from the first body in a second direction, and wherein the second direction is approximately perpendicular to the first direction.

17. The control valve assembly of claim 16, wherein the first body and the second body together form a first side and a second angled side.

18. The control valve assembly of claim 17, wherein the second angled side is interfaced with the angled pedestal wall when the control valve assembly is in an off position to mitigate rotary backlash of the control valve assembly in the off position.

19. The control valve assembly of claim 15, wherein the angled pedestal wall of the second pedestal is defined by a predetermined angle of approximately ten degrees to approximately thirty degrees relative to the vertical direction.

20. The control valve assembly of claim 15, wherein the valve shaft further comprises a valve stem, and wherein the valve stem is extended from the second end of the cylindrical arm.