US 20120308940A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2012/0308940 A1

(43) Pub. Date: Dec. 6, 2012

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(54) **NATURAL GAS PURGE BURNER AND ASSOCIATED SYSTEMS AND METHODS**

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(21) Appl. No.: **13/151,364**

(22) Filed: **Jun. 2, 2011**

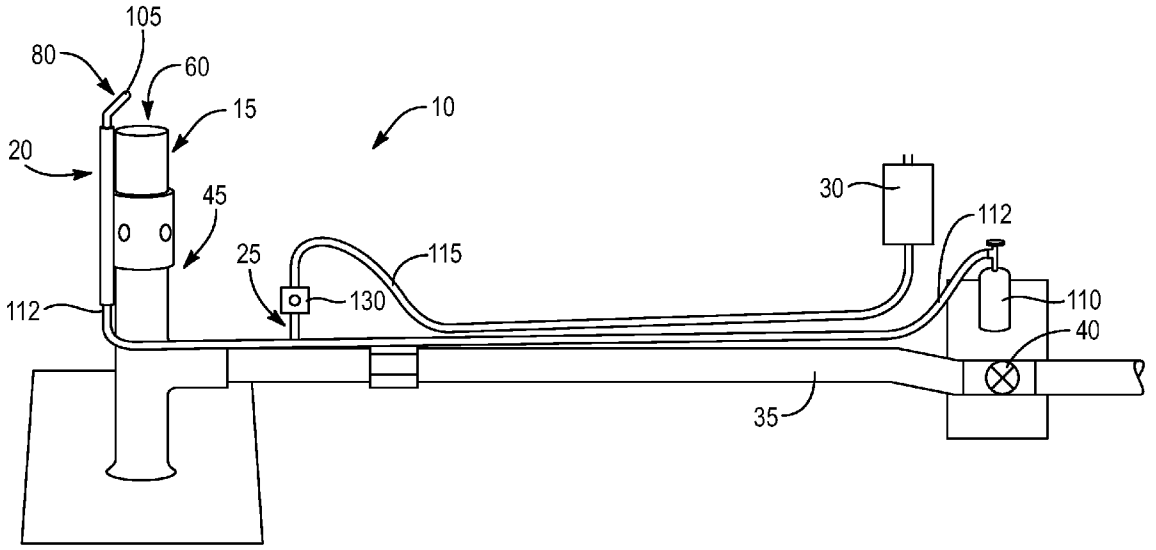
Publication Classification

(51) **Int. Cl.**
F23D 14/50 (2006.01)

(52) **U.S. Cl.** **431/3**; 431/121; 431/43

(57) **ABSTRACT**

Systems and methods for purging air and/or one or more inert gases from a flammable gas system, such as a natural gas pipeline, are described. In particular, this application discusses systems and methods for making and using a gas purge burner to purge air/inert gases from a flammable gas system. The gas purge burner includes a burner having a gas inlet and a gas escape vent. The burner also has a continuous ignition mechanism that includes an igniter (such as a pilot light and/or an electric igniter) that is disposed near the gas escape valve. The burner also has a gas outlet that can be disposed between the gas inlet and the gas escape vent and which is also configured to direct gases from the burner to a gas measurement device. The burner can be used to monitor the amount of flammable gas flowing into the burner and to continually ignite and burn off such gas until the stream of gas passing through the burner is substantially pure. Thus, the gas burner can allow a user to perform such tasks while being removed a safe distance from the actual burner, increasing the safety of the user during the pursing process. Other implementations are described.



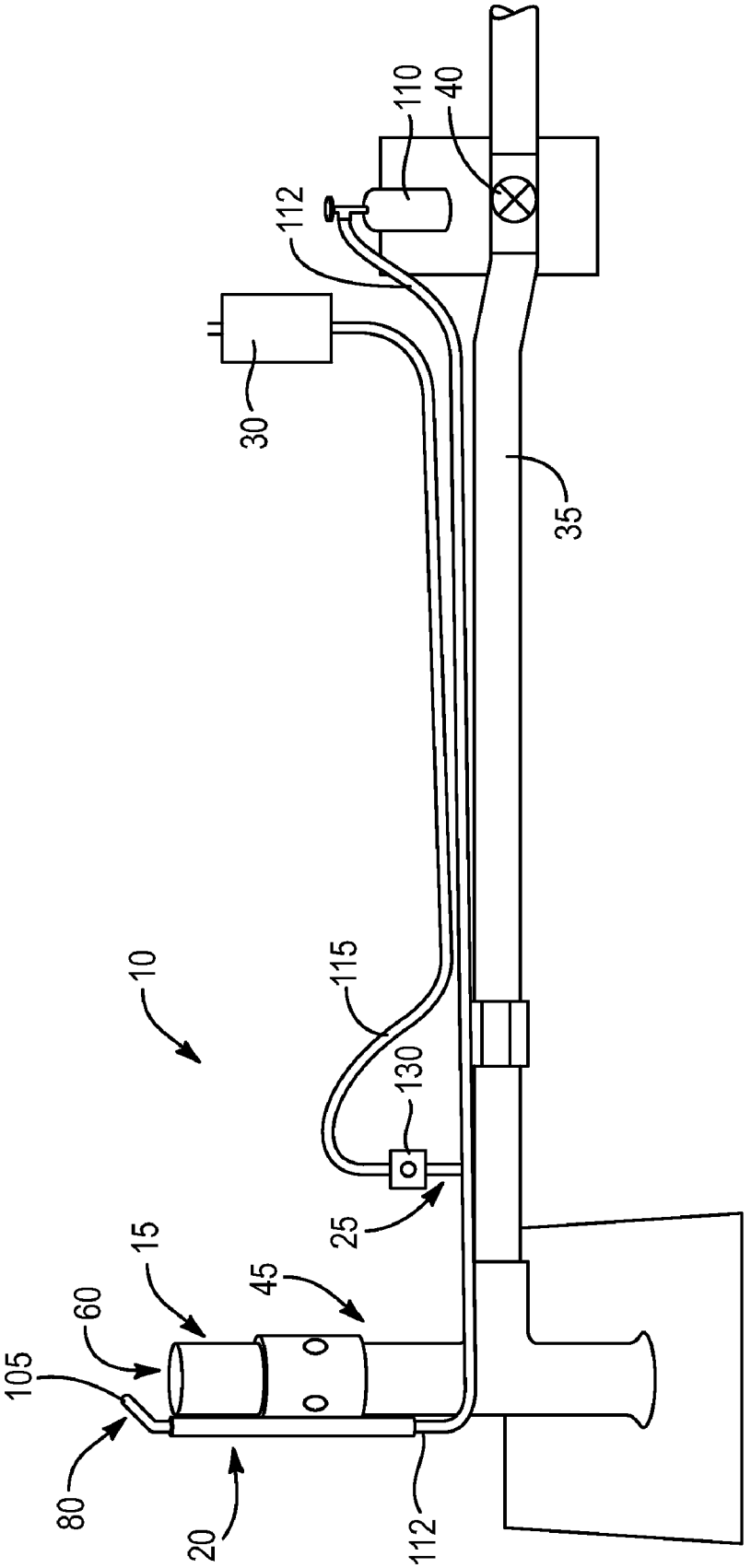


Figure 1

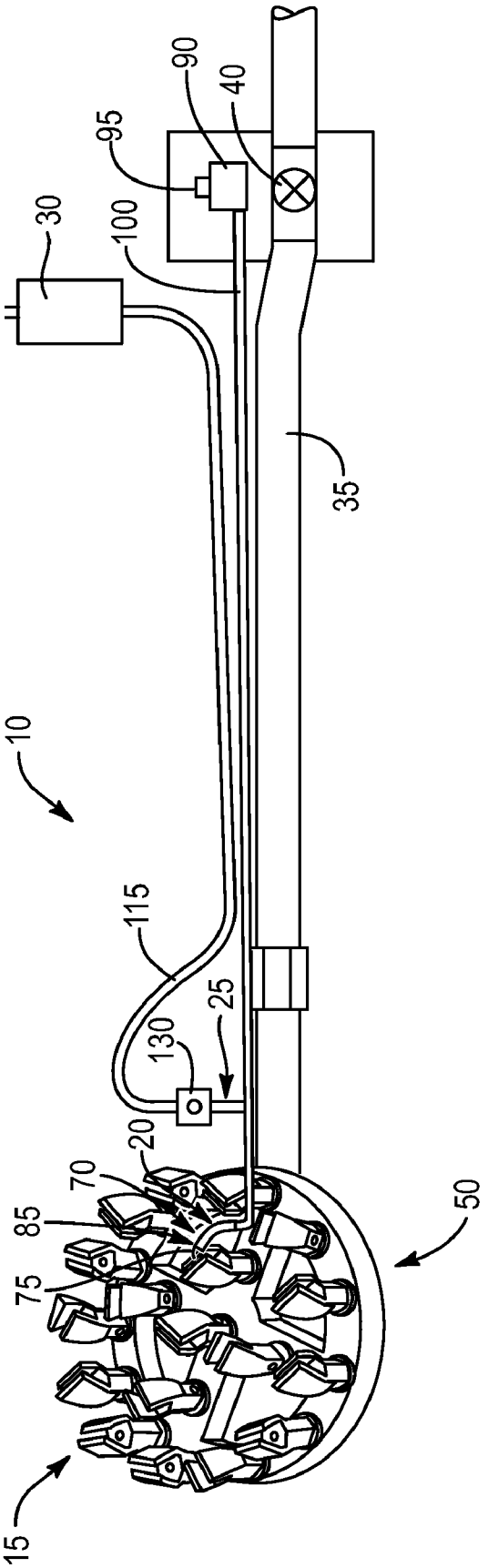


Figure 2

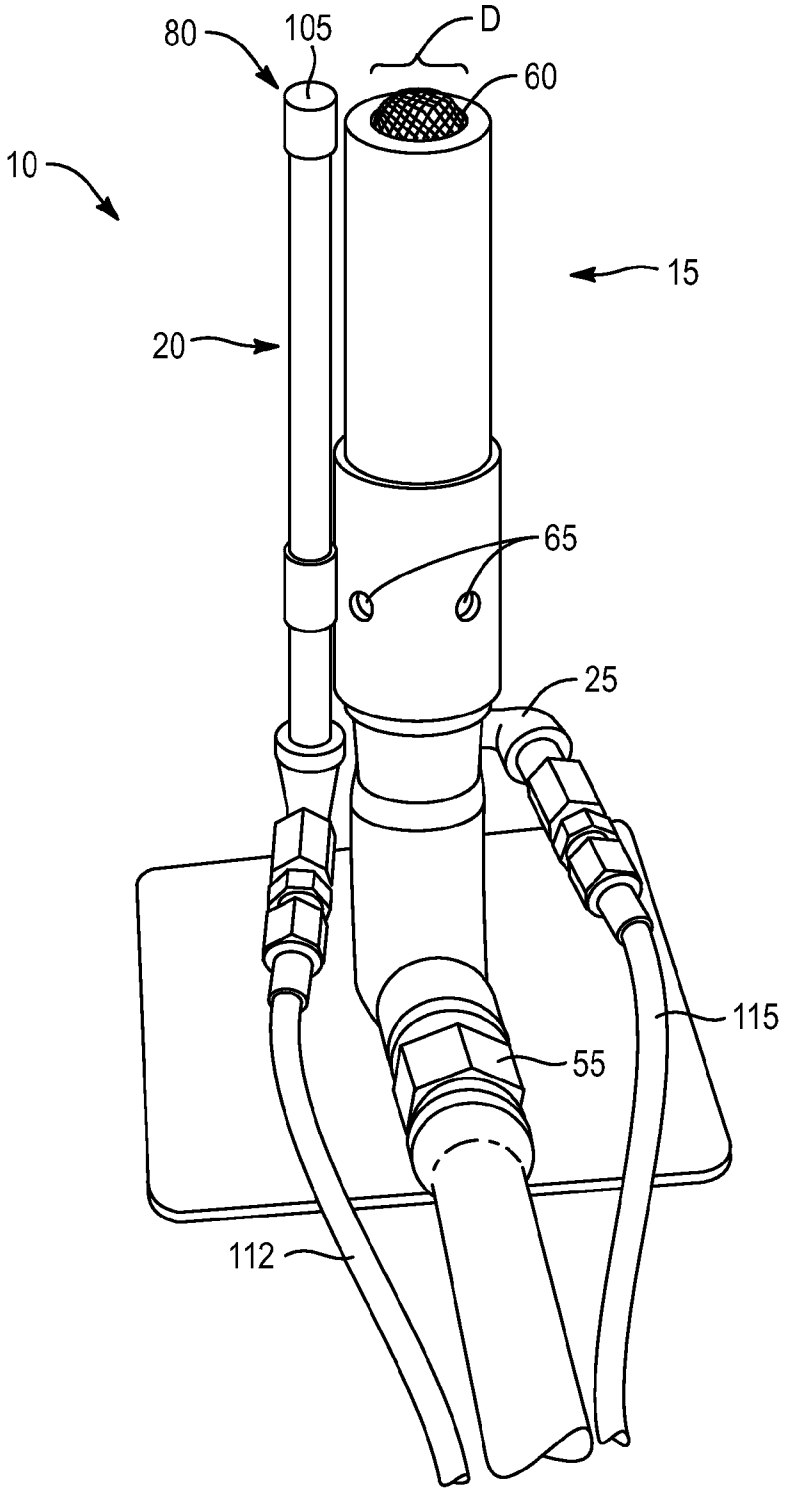


Figure 3

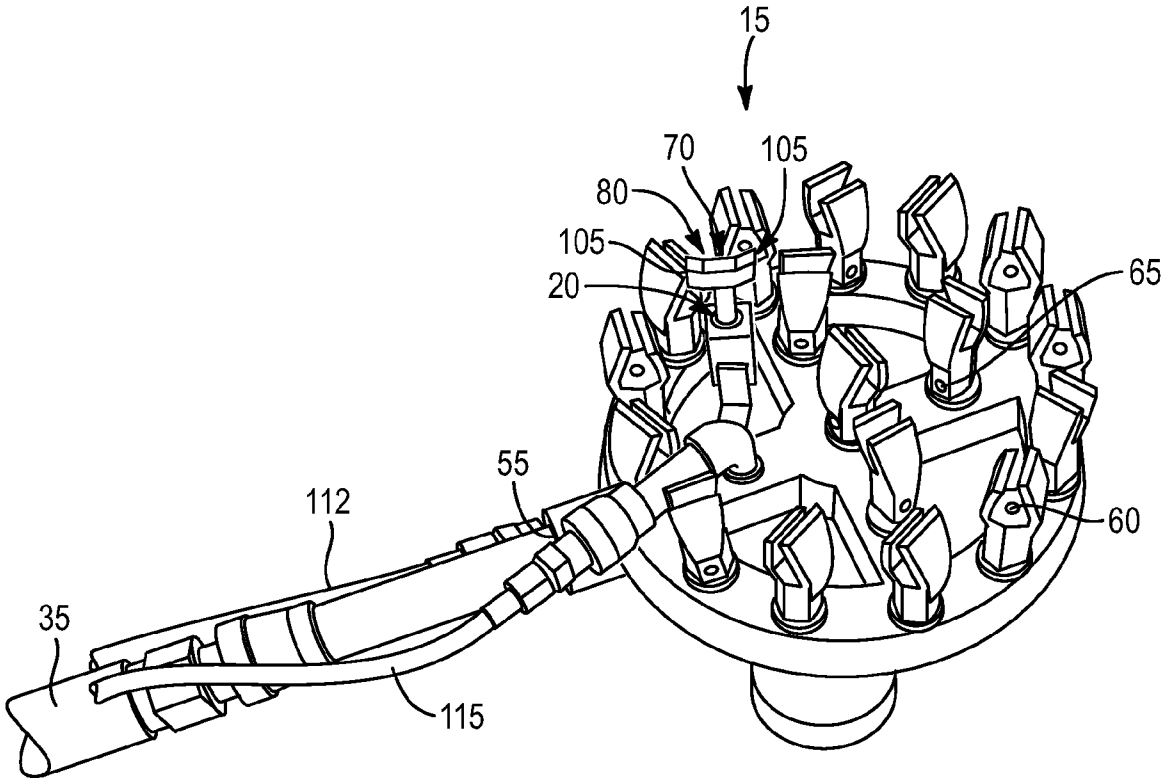


Figure 4

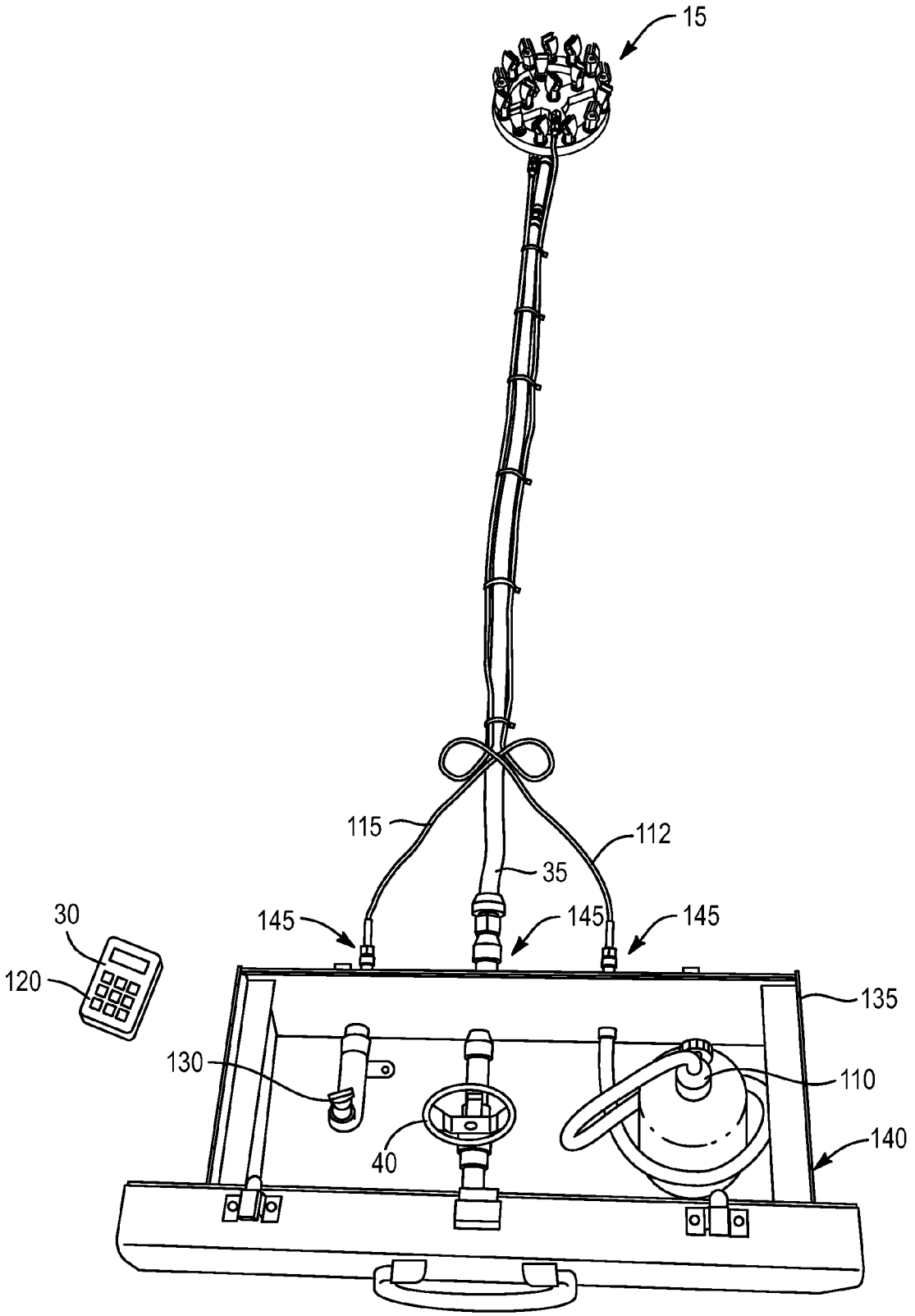


Figure 5

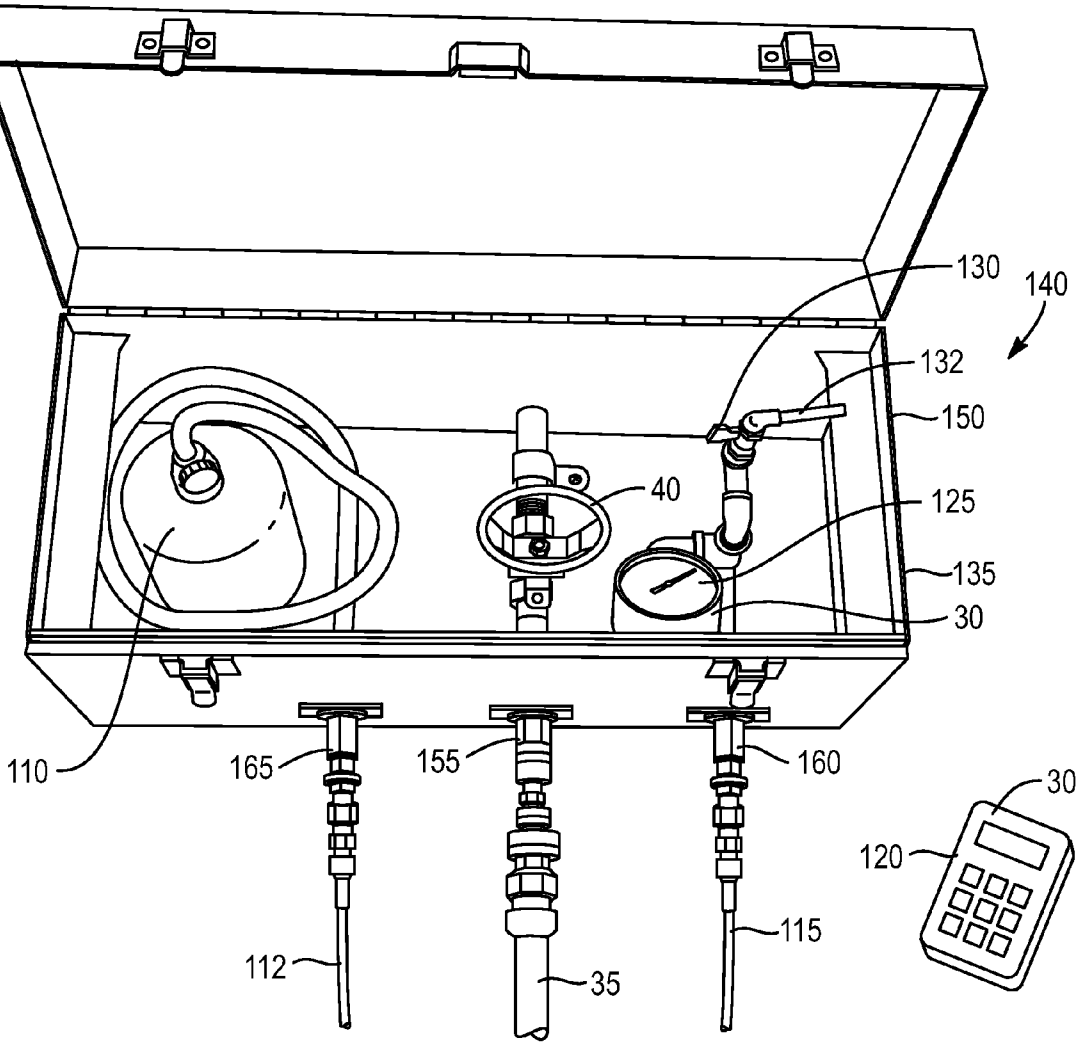


Figure 6A

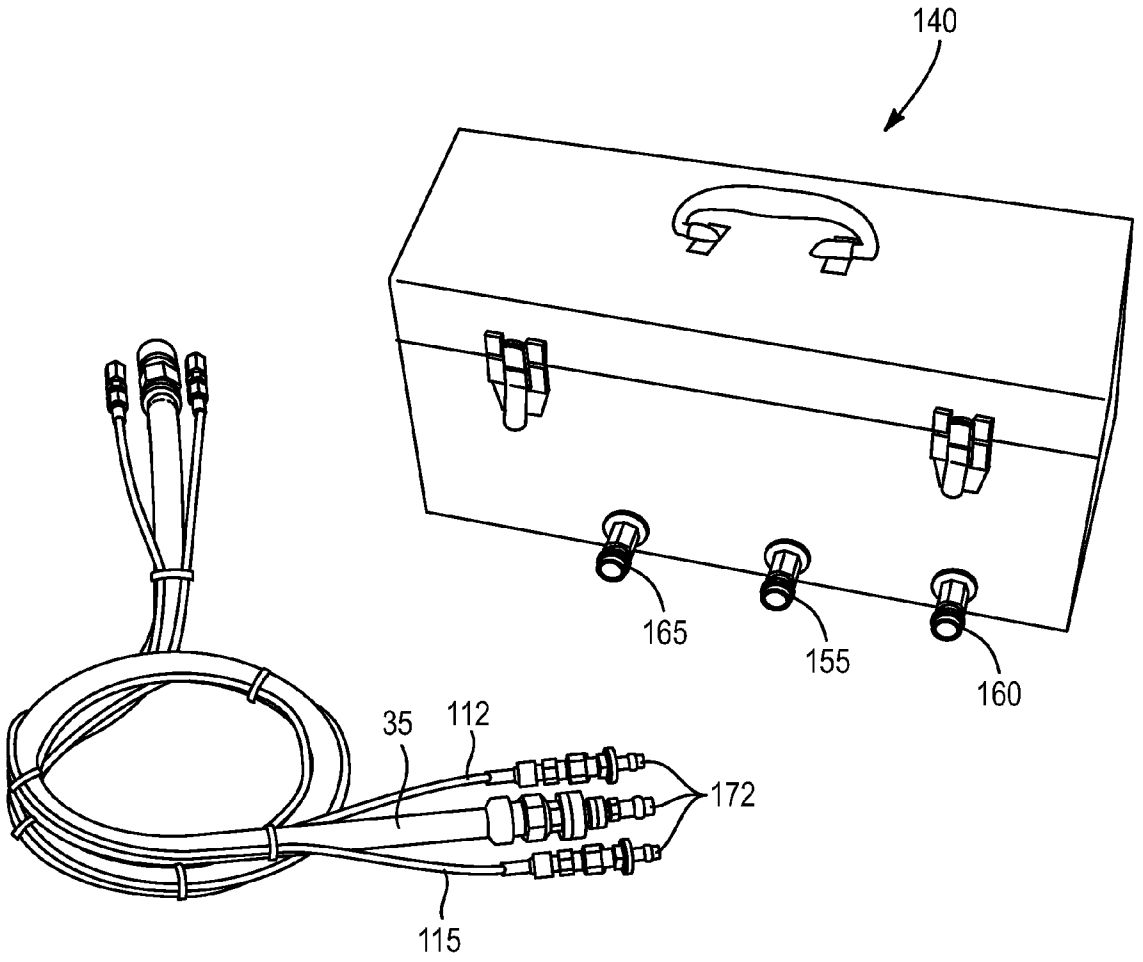


Figure 6B

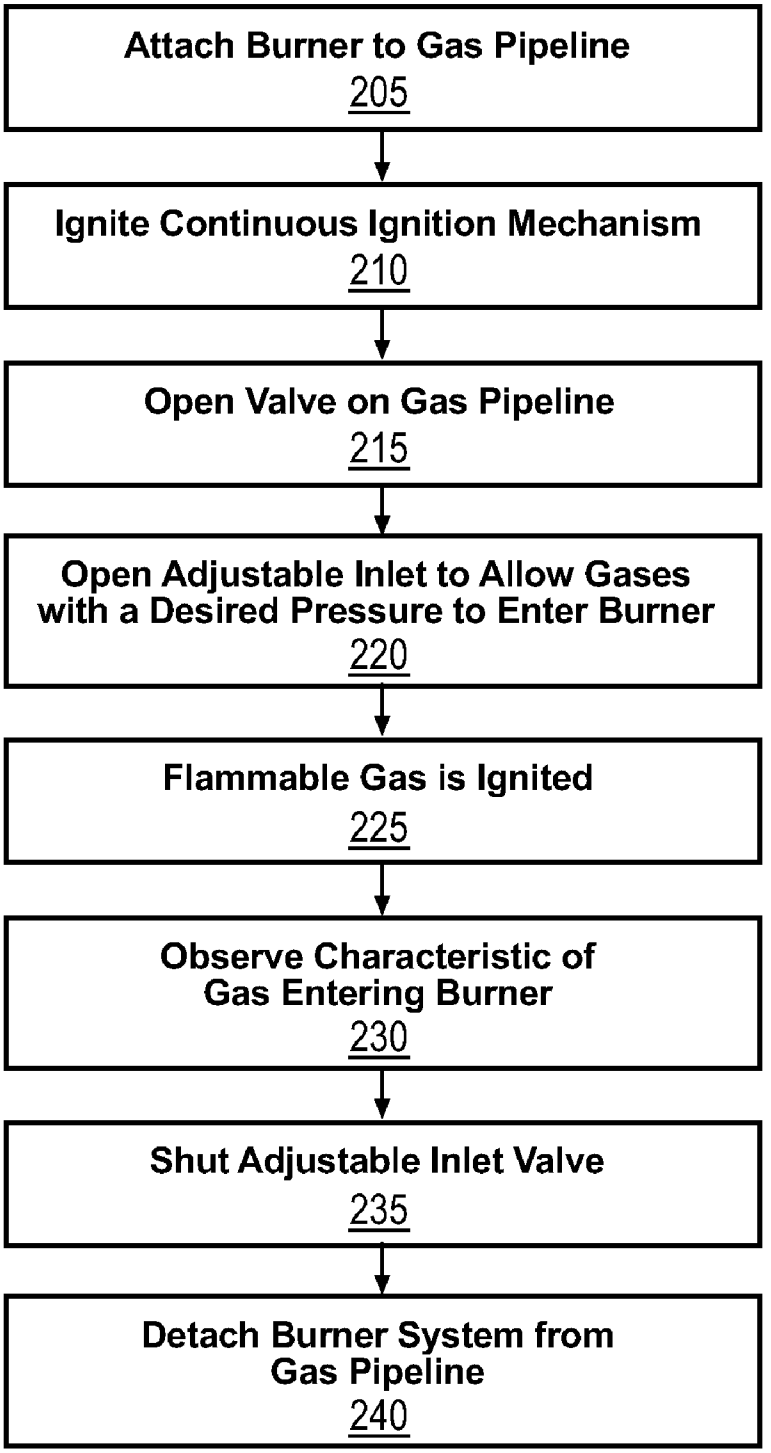

Attach Burner to Gas Pipeline
205
Ignite Continuous Ignition Mechanism
210
Open Valve on Gas Pipeline
215
Open Adjustable Inlet to Allow Gases with a Desired Pressure to Enter Burner
220
Flammable Gas is Ignited
225
Observe Characteristic of Gas Entering Burner
230
Shut Adjustable Inlet Valve
235
Detach Burner System from Gas Pipeline
240

Figure 7

NATURAL GAS PURGE BURNER AND ASSOCIATED SYSTEMS AND METHODS

FIELD

[0001] This application relates generally to safety equipment for use with natural gas pipelines. More specifically, this application relates to systems and methods for making and using a natural gas purge burner.

BACKGROUND

[0002] Before a newly constructed natural gas pipeline is put into service or an existing natural gas pipeline is repaired or extended, the pipeline must be purged of air. In some instances, this purging process can be performed by injecting a slug of an inert gas, such as nitrogen, into the pipeline. In other instances, this purging process can be done by passing natural gas directly through the pipeline to displace any air that has accumulated therein. In such instances, however, the air and the natural gas tend to mix and form flammable mixtures within the pipeline.

[0003] When a slug of an inert gas or natural gas is used to purge air from a natural gas pipeline, a portion of the pipeline (such as a shutoff valve) is typically opened so that the air, inert slug, and/or the natural gas and air mixture can be forced out of the pipeline. In this process, a user (such as a natural gas technician) allows the inert gas and/or natural gas and air mixture to flow from the pipeline until the user detects a substantially pure concentration of natural gas flowing through the pipeline. Such purging techniques help ensure that a substantially pure stream of natural gas flows to appliances and equipment that are connected to the pipeline.

[0004] This application relates to systems and methods for purging air and/or one or more inert gases from a flammable gas system, such as a natural gas pipeline. In particular, this application discusses systems and methods for making and using a gas purge burner to purge air/inert gases from a flammable gas system. The gas purge burner includes a burner having a gas inlet and a gas escape vent. The burner also has a continuous ignition mechanism that includes an igniter (such as a pilot light and/or an electric igniter) that is disposed near the gas escape valve. The burner also has a gas outlet that can be disposed between the gas inlet and the gas escape vent and which is also configured to direct gases from the burner to a gas measurement device. The burner can be used to monitor the amount of flammable gas flowing into the burner and to continually ignite and burn off such gas until the stream of gas passing through the burner is substantially pure. Thus, the gas burner can allow a user to perform such tasks while being removed a safe distance from the actual burner, increasing the safety of the user during the pursing process.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The following description can be better understood in light of the Figures, in which:

[0006] FIG. **1** shows a side schematic view of some embodiments of a gas purge burner system comprising a burner having a single gas escape vent;

[0007] FIG. **2** shows a side schematic view of some embodiments of the gas purge burner system comprising multiple gas escape vents;

[0008] FIG. **3** shows a side perspective view of some embodiments of the gas purge burner comprising one gas escape vent;

[0009] FIG. **4** shows a side perspective view of some embodiments of the gas purge burner comprising multiple gas escape vents;

[0010] FIG. **5** shows a top perspective view of some embodiments of the gas purge burner system comprising a control apparatus;

[0011] FIG. **6**A shows a top perspective view of some embodiments of the control apparatus;

[0012] FIG. **6**B shows a side perspective view of some embodiments of the control apparatus; and

[0013] FIG. **7** depicts a flowchart showing some embodiments of a method for using the gas purge burner system.

[0014] The Figures illustrate specific aspects of the described gas purge burners and systems and methods for making and using such burners. Together with the following description, the Figures demonstrate and explain the principles of the structures, methods, and principles described herein. In the drawings, the thickness and size of components may be exaggerated or otherwise modified for clarity. The same reference numerals in different drawings represent the same element, and thus their descriptions will not be repeated. Furthermore, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the described devices. Moreover, the Figures may show simplified or partial views, and the dimensions of elements in the Figures may be exaggerated or otherwise not in proportion for clarity.

DETAILED DESCRIPTION

[0015] The following description supplies specific details in order to provide a thorough understanding. Nevertheless, the skilled artisan will understand that the described gas purge burner systems and associated methods of making and using the burner systems can be implemented and used without employing these specific details. Indeed, the burner systems and associated methods can be placed into practice by modifying the illustrated devices and methods and can be used in conjunction with any other apparatus and techniques conventionally used in the industry. For example, while description refers to gas pipelines, it could be modified and used with other pipelines, such as those transporting liquid fuels.

[0016] In addition, as the terms on, attached to, or coupled to are used herein, one object (e.g., a material, a layer, a substrate, etc.) can be on, attached to, or coupled to another object regardless of whether the one object is directly on, attached, or coupled to the other object or there are one or more intervening objects between the one object and the other object. Also, directions (e.g., above, below, top, bottom, side, up, down, under, over, upper, lower, horizontal, vertical, "x," "y," "z," etc.), if provided, are relative and provided solely by way of example and for ease of illustration and discussion and not by way of limitation. In addition, where reference is made to a list of elements (e.g., elements a, b, c), such reference is intended to include any one of the listed elements by itself, any combination of less than all of the listed elements, and/or a combination of all of the listed elements.

[0017] The Figures illustrate some embodiments systems containing and methods for making and using the burner systems to purge gas pipelines, including those within in a building, those buried in the ground, and those above ground. The burner systems can be used to purge any suitable gas from a gas system, including natural gas, butane, propane, air, one or more inert gases, vapors from liquid fuels, and mixtures thereof. The burner systems can purge air and/or an inert gas

from a pipeline before the pipeline is put into service, it can also be used to purge natural gas (or another flammable gas) from an existing pipeline before that pipeline is repaired or otherwise modified.

[0018] In some methods for purging air and/or inert gases from a natural gas pipeline, a user connects the pipeline to a standard Bunsen burner and then opens a shutoff valve on the pipeline to allow gases from the pipeline to flow through the Bunsen burner. As the gases flow through the Bunsen burner, the user places a gas measurement instrument near a mouth of the burner to detect the presence of natural gas. While doing this, the user continuously attempts to use a match or lighter to manually ignite any natural gas flowing from the Bunsen burner. The user continues with this process until it can be determined that a substantially pure stream of natural gas is flowing from the pipeline into the Bunsen burner.

[0019] Such methods can be dangerous. When the user leans over (or is otherwise close to) the Bunsen burner, the user can be badly burned while attempting to light the Bunsen burner. Additionally, while trying to light the Bunsen burner and/or trying to determine the concentration of natural gas flowing out of the unlit Bunsen burner, a significant amount of flammable gas can be emitted. As a result, when the user ignites the natural gas, the user may cause an explosion—especially where the user is purging the pipeline in an enclosed space (e.g., within room or a building).

[0020] The gas purge burner systems illustrated in the Figures and described herein can be used to monitor the amount of natural gas (or other flammable gas) flowing into the gas purge burner and burn off such gas until the stream of gas passing into the burner is substantially pure. Moreover, the burner systems allow the user to perform such tasks while being removed a safe distance away from the actual burner. The purge burner system can be configured with any components to operate in this manner, including those components depicted in the Figures.

[0021] FIGS. **1** and **2** show some embodiments in which the gas purge burner system **10** comprises a burner **15**, an ignition mechanism **20**, a gas outlet **25** (which optionally connects or channels gas to a gas measurement device **30**), a gas line **35**, and an adjustable gas inlet valve **40**. The burner **15** can be any burner that is capable of burning off an impure natural gas mixture (or other flammable gas mixture) until a substantially pure stream of gas flows into the burner. Some examples of suitable burners include one or more Bunsen burners, wok burners (e.g., duckbill burners, chimney burners, Mongolian burners, double-ring burners, triple-ring burner, etc.), burners, and/or combinations thereof. By way of illustration, FIGS. **1** and **2** respectively show that the burner **15** can comprise a modified Bunsen burner **45** and a wok burner **50**.

[0022] The burner **15** can be configured with any known component. FIGS. **3** and **4** show some embodiments in which the burner **15** comprises one or more gas inlets **55**, gas escape vents **60**, and air inlets **65**. In these embodiments, gases (e.g., inert gas, natural gas, and/or air) from a gas system (e.g., a natural gas pipeline) can flow through the gas inlet **55**, into the burner **15**, past the air inlet(s) **65** (which allow air to mix with the gases), and out of the gas escape vent(s) **60**, where any flammable gases may be ignited and burned.

[0023] The burner **15** can be configured to produce any desired amount of heat energy that allows the burner to purge a gas system. Indeed, some embodiments of the burner are able to produce an amount of heat energy that is greater than about 500 British thermal Units (BTUs), about 1,000 BTUs, about 10,000 BTUs, about 100,000 BTUs, about 200,000 BTUs, about 1,000,000 BTUs, or about 1,500,000 BTUs. In other embodiments, the amount of heat energy the burner is capable of producing is less than an amount selected from about 2,500,000 BTUs, about 1,200,000 BTUs, about 500,000 BTUs, about 200,000 BTUs, and about 110,000 BTUs. In yet other embodiments, the burner can be capable of producing between about 40,000 and about 100,000 BTUs. In still other embodiments, the burner can produce any combination or sub-ranges of these amounts of heat energy. Further, some embodiments of a wok burner (e.g., burner **50**) can be configured to produce between about 100,000 BTUs and about 125,000 BTUs and some embodiments of the modified Bunsen burner (e.g., burner **45**) may be configured to produce between about 100,000 BTUs and about 1,000,000 BTUs.

[0024] The burner **15** can be configured to contain any suitable number of gas escape vents **60**, including 1, 2, 3, 4, 5, 6, or more. For instance, while FIG. **3** shows the burner **15** can comprise a single gas escape vent **60**, FIG. **4** shows some embodiments in which the burner **15** comprises 17 gas escape vents **60**.

[0025] The vents **60** of the burner **15** can be modified to produce a desired amount of heat energy. Thus, the width (i.e., diameter) of an orifice of the gas escape vents **60** can be modified to be any suitable size that allows the burner to burn off natural gas that flows through the burner. In some embodiments, the gas escape vent **60** can have an orifice with an inner diameter D (shown in FIG. **3**) that is greater than a length selected from about 0.5 centimeters (cm), about 2 cm, about 5 cm, and about 8 cm. In other embodiments, the inner diameter D of the burner can be smaller than a length selected from about 1 meter (m), about 0.5 m, about 20 cm, about 12 cm, and about 10 cm. In yet other embodiments, the gas escape vent has an orifice with an inner diameter between about 1.5 cm and about 5 cm. In still other embodiments, the vents can be configured with combination or sub-ranges of these diameters. Thus, the burner can be used with any suitable size of gas pipeline, including residential, commercial, and industrial gas pipelines (e.g., natural gas pipelines used in power plants).

[0026] The ignition mechanism can ignite natural gas (or another flammable gas) that flows from the gas escape vents. In some embodiments, the ignition mechanism can substantially continuously ignite natural gas (or another flammable gas) that flows from the gas escape vent **60** and thus comprises a continuous ignition mechanism **20**. Thus, the ignition mechanism can comprise any suitable element or elements that continuously, continually, and/or on demand emit heat, fire, sparks, and/or arcs of electricity near the gas escape vent to light flammable gases flowing from the vent. In some embodiments, the ignition mechanism can comprise any suitable igniter, such as an electric igniter, a pilot light, a spark igniter, or any combination thereof. By way of illustration, FIG. **2** shows that the igniter **70** can comprise an electric igniter **75** and FIG. **4** shows that the igniter **70** can comprise a pilot light **80**.

[0027] Where the igniter **70** comprises an electric igniter **75**, the igniter can be configured to allow the user to light flammable gas flowing from the burner **15** without requiring the user to be directly adjacent to the burner as it is lit. Some examples of suitable electric igniters include one or more piezoelectric igniters, electric matches, motorized flint wheel igniters, hot surface igniter, glow plugs, heated bridge wires,

or combinations thereof. By way of illustration, FIG. **2** shows the electric igniter **75** can comprise a piezoelectric igniter **85**.

[0028] Where the continuous ignition mechanism **20** comprises an electric igniter **75**, it can comprise a power source (e.g., a battery, a plug connected to an electrical power grid, etc.) to power the ignition mechanism, a switch to selectively activate and/or deactivate the electric igniter, and/or wires to electrically connect the power source to the electric igniter. FIG. **2** shows some embodiments in which the ignition mechanism **20** comprises a power source **90** (e.g., a battery) and a switch **95** that are remotely connected to the electric igniter **75** via wires **100**. Thus, in these embodiments, the user is able to light the burner **15** (continuously, continually, and/or on demand) while being a safe distance away from the burner itself.

[0029] Where the continuous ignition mechanism **20** comprises a pilot light **80**, the pilot light can be configured to light natural gas flowing from the burner **15** while the user is located a safe distance away from the burner. By way of illustration, FIGS. **1** and **3** show the pilot light **80** can have one or more nozzles **105** that are configured to direct a flame towards (or in the vicinity of) one or more gas escape vents **60**. While the pilot light **80** can be fueled by any suitable fuel source, FIG. **1** shows some embodiments in which the ignition mechanism **20** comprises a portable container **110** of a flammable gas, such as butane, propane, and/or combinations thereof. In such embodiments, the pilot light can be lit and remain ignited, even when inert gases and/or relatively large amounts of air are passing through the burner.

[0030] Where the pilot light **80** is fueled by a container **110** of a flammable gas, the container can be connected to the pilot light using any connection. Examples of these connections include through the use of tubing (pilot light tubing), such as polyethylene tubing, polyvinyl chloride tubing, stainless-steel mesh reinforced tubing, steel tubing, copper tubing, yellow brass tubing, ductile iron tubing, aluminum tubing, corrugated stainless steel tubing, and/or combinations thereof. In some embodiments, the pilot light is connected to the container through a flexible stainless steel reinforced tubing.

[0031] The pilot light tubing can be any suitable length that allows it to connect the pilot light **80** to the container. In some embodiments, the pilot light tubing is longer than a length selected from about 1 cm, about 0.5 m, about 1 meter, and about 2 meters. In other embodiments, the pilot light tubing is shorter than a length selected from about 16 m, about 8 m, about 4 m, and about 3 m. In yet other embodiments, the pilot light tubing can be between about 1.6 m and about 3.8 m. In still other embodiments, the pilot light tubing can be any combination or range of these lengths. Thus, the user can control the pilot light while being safely removed from the burner.

[0032] In some embodiments, as discussed above, the burner **15** optionally comprises a gas outlet **25** that allows gases to exit the burner before reaching the gas escape vent **60**. In such embodiments, the gas outlet can be configured to allow gases to be channeled away from the burner and to a gas measurement device **30**. The gas outlet **25** can be disposed in any suitable location on the gas purge burner system **10** that allows it to operate as an outlet. In some embodiments, the gas outlet is disposed between the burner's air inlet(s) **65** and the adjustable gas inlet valve **40**. FIG. **3** shows some embodiments in which the gas outlet **25** is disposed (e.g., comprises a T-joint or is tapped in the burner) between the burner's air inlets **65** and the burner's gas inlet **55**. Accordingly, the gas outlet can channel gases from the gas system to a gas measurement device **30** before such gases mix with air that enters the burner **15** through its air inlets.

[0033] The gas outlet can comprise one or more connectors (e.g., treaded couplings, quick-connect couplings, and/or barbed couplings) for connecting the outlet to a conduit **115** (see FIGS. **1** through **4**) that is capable of channeling gases from the burner **15** to a gas measurement device **30**. The gas outlet **25** (and/or conduit **115**) is optionally connected to one or more valves (or gas measurement device valves) to selectively allow and/or prevent gases from the burner **15** from passing out of the gas outlet and/or the conduit. For example, FIG. **1** shows that a pet cock **130** can be disposed near the gas outlet **25** and FIG. **6**A shows that a pet cock **130** can be disposed near an end of the conduit **115**. Accordingly, by opening the pet cock, the operator can allow gases from the burner to flow to the gas measurement device. In contrast, by closing the pet cock, the user can prevent flammable gases from exiting the pet cock when the user is not measuring a characteristic of gas flowing into the burner.

[0034] The gas outlet can be connected (i.e., directly or indirectly) to a coupler, a hose, piping, and/or any other component that allows the gases exiting the burner through the gas outlet to be channeled to a gas measurement device **30**. For example, FIG. **6**A shows that the conduit **115** extending from the gas outlet **25** (not shown in FIG. **6**A) can be connected to the pet cock **130** which, in turn, is coupled to a flexible hose **132** that can be used to direct gases to the gas measurement device **30**.

[0035] The conduit **115** can be configured with the desired safety in mind. In some embodiments, the conduit can comprise any material that can be used to create the pilot light tubing **112**, discussed above. Similarly, the conduit can have any suitable length (as discussed above with respect to the pilot light tubing), having any suitable inner diameter, and/or being flexible or solid. In some embodiments, the conduit comprises flexible tubing that is between about 1.5 m and about 4.5 meters. Thus, the user can measure characteristics of gases passing into the burner **15** while being safely removed from the burner.

[0036] When present, the gas measurement device can comprise any suitable instrument that measures one or more characteristics of such gases. In one example, the gas measurement device can measure the amount (e.g., percent, ratio, concentration, etc.) of one or more flammable gases (e.g., natural gas), oxygen, inert gases (e.g., nitrogen), and/or other gases flowing through the gas outlet **25**. FIG. **5** shows some embodiments where the gas measurement device **30** can comprise a combustible gas indicator **120**, which is capable of determining the percent of the total amount of gas reaching the device that is flammable. FIG. **6**A shows embodiments where the gas measurement indicator **30** comprises a pressure gauge **125** (e.g., a water column gauge) and/or a combustible gas indicator **120**.

[0037] The gas line **35** can connect the burner **15** to the adjustable inlet valve **40**. Accordingly, the gas line can comprise any suitable material that can be used to create the pilot light tubing **112**, discussed above. The gas line can also configured with any suitable length, as discussed above with respect to the pilot light tubing, with any suitable inner diameter, and can be flexible or solid. In some embodiments, the gas line comprises flexible tubing that is between about 1.5 m

and about 4.5 meters. Thus, the user can control the adjustable pressure valve while being safely removed from the burner.

[0038] The burner system **10** also contains one or more gas adjustable inlet valves **40**. Some examples of adjustable gas inlets include a plug, a gate, and a ball gas inlet valve. The gas inlet valve can selectively open and close and is therefore capable of reducing and/or regulating the pressure of the gas that flows from a gas system into the burner **15**. In some embodiments, the inlet valve can receive gas from the gas system at a pressure that is higher than about 27 inches of water column (inches WC), about 100 inches WC, about 1,500 inches WC, and about 3,000 inches WC (and any combination or range of these pressures) and then release such gases into the gas line **35** at a pressure that is lower than a pressure of about 130 inches WC, about 40 inches WC, about 20 inches WC, about 10 inches WC, about 7 inches WC, and about 5 inches WC (and any combination or range of these pressures). For example, when using a 125 PSI valve, the pressure at the burner can be range from as little as about 3 inches WC to as much as 125 PSI, depending on the rating of the burner.

[0039] In some configurations, the burner **15** can comprise a plurality of legs to raise the burner to a desired level. In other configurations, as shown in FIG. **5**, the burner system **10** can optionally comprise a control apparatus **135**. The control apparatus can carry attachment couplers (or couplings) that allow the burner to be quickly attached to the adjustable inlet valve **40**, the container **110** of flammable gas (e.g., via the pilot light tubing **115**), the power source **90** for the electric igniter **75**, and/or the conduit **115** that directs gases from the burner to a gas measurement device **30**. FIG. **5** shows that the control apparatus **135** can comprise a support structure **140** and one or more couplings **145**. The support structure can comprise a container (such as a tool box, a tray, a tote box, and/or a bag) which can hold one or more couplings **145** and other objects, such as the gas measurement device **30**, the container **110** of flammable gas, etc. FIGS. **5** through **6**B show some embodiments in which the support structure **140** comprises tote box **150**.

[0040] The couplings **145** can be configured to connect the continuous ignition mechanism **20** to the container **110** of flammable gas and/or the power source **90**; to connect the gas line **35** to the adjustable inlet valve **40**; and/or to direct gases from the conduit **115** to the gas measurement device **30**. Examples of some couplings include one or more electrical connectors (e.g., plugs or sockets), female sleeve-type couplings with mating nipples, pneumatic couplers, twist-lock couplings, self-locking couplings, plug-in connectors, quick-couplings, express couplings, barbed nipples, threaded tubing, dual cone couplings, and combinations thereof.

[0041] FIG. **6**A shows several other features of the control apparatus **135**. This control apparatus can comprise a first female sleeve-type coupling **155** to connect the gas line **35** to the inlet valve **40**. The control apparatus **135** can also comprise a second female sleeve-type coupling **160** to connect conduit **115** from the gas outlet **25** (not shown in FIG. **6**A) to one or more gas measurement devices **30** (e.g., the pressure gauge **125**). The control apparatus **135** can also comprise a third female sleeve-type coupling **165** to connect the pilot light **80** (not shown in FIG. **6**A) to the container **110** of flammable gas (e.g., via the pilot light tubing **112**). The control apparatus **135** also contains a piping that extends past the inlet valve **40** to an end (not shown) that is configured to be connected (e.g., via treading, a quick release coupler, etc.) to a gas pipeline. FIG. **6**B shows that the gas line **35**, conduit **115**, and/or pilot light tubing (not shown in that figure) can each comprise a corresponding mating nipple **172**.

[0042] The burner system **10** can be made of any material that allows it to function as described herein. In some embodiments, the burner system (i.e., the burner **15**) includes one or more metals (e.g., aluminum, iron, steel, brass, etc.), ceramics, resins, polymers, resinoids, or combinations thereof.

[0043] The burner system **10** described herein can be made using any process that forms the structures described herein. By way of example, the burner system can be formed through a process involving molding, extruding, casting, cutting, etching, grinding, stamping, drilling, welding, bonding, tapping, dying, screwing, twisting, bending, assembling, and/or any other suitable process.

[0044] FIG. **7** illustrates some embodiments of a method **200** for using the burner system. The method shown in FIG. **7** can be modified in any suitable manner, including by rearranging, adding to, removing, and/or modifying any portion or portions of the method. At box **205**, the method **200** begins by connecting the burner **15** to a gas pipeline (e.g., via an attachment connected to the adjustable gas inlet valve **40**). The method continues as the user ignites the continuous ignition mechanism **20** (e.g., the pilot light **80**), as shown in box **210**.

[0045] Next, box **215** shows the user can open a shut-off valve (not shown) on the gas pipeline to release gas therefrom to the adjustable inlet valve **40**. At this point, box **220** shows the user can then open the adjustable inlet valve. In so doing, the user can open the inlet valve **40** to allow any pressure of gas from the gas pipeline to flow into the burner **15**. In some embodiments, the user can regulate the inlet valve so that gases entering the burner have a pressure of less than about 27 inches WC, about 12 inches WC, about 8 inches WC, or about 7 inches WC. In other embodiments, the user can regulate the inlet valve so that gases entering the burner have a pressure greater than about 0.1 inches WC, about 2 inches WC, about 4 inches WC, or about 5 inches WC. In yet other embodiments, the user can adjust the inlet valve to allow any range or combination of these pressures to enter the burner. For example, the user can adjust the inlet valve to allow gases having a pressure of between about 3 and about 9 inches WC, and more specifically, between about 5 and about 7 inches WC, to enter the burner. While these pressures can be used for some burners, other burners can burn at any pressure as long as the ratio of orifice to primary air is for that pressure and all fittings are rated for that pressure.

[0046] As the gases pass through the burner **15** at the desired pressure, box **225** shows that any flammable gases can be ignited by the continuous ignition mechanism **20**. Additionally, box **230** shows that the user can observe the characteristics of (e.g., percentage of flammable gas in) the gases that enter the burner. Once the user determines that gases entering into the burner **15** have one or more desired characteristics, such as a concentration of more than about 90% natural gas, box **235** shows the user can shut the inlet valve **40** and the shut-off value that closes the gas pipeline. Box **240** shows the user can then detach the burner system **10** from the pipeline and begin using the pipeline to channel natural gas to a desired location (e.g., an appliance).

[0047] The burner system **10** has several useful features. In some configurations, because the burner system allows the user to ignite the burner and/or measure one or more characteristics of gases passing through the burner while being a

safe distance away from the burner, the burner system can provide a safe way to purge gas pipelines. In some configurations, since the burner **15** can continuously ignite any flammable gases that flow from the gas escape vent **60**, the burner reduces the amount of flammable gas that is released into the ambient air, thereby reducing the incidence of explosion and allowing the burner system to be used indoors. In some configurations, by substantially continuously burning natural gas that flows through the burner, the burner system releases less natural gas into the environment than some gas purge methods and making the burner system **10** more environmentally friendly than such gas purge methods.

[0048] A fourth useful feature is that in some configurations the burner **15** can easily be modified (e.g., can be configured to have a large orifice) to burn large amounts of natural gas and can be used to purge large volumes of gases from a gas system in a relatively short period of time. Thus, the burner can greatly reduce the amount of time needed to purge a gas pipeline, saving money by reducing labor costs and by allowing the pipeline to become operational sooner that it could through the use of some purging equipment.

[0049] A fifth useful feature is that in some configurations the gas outlet **25** channels gases to the gas measurement device **30** before such gases reach the gas escape vent **60**. Thus, the user can measure the concentration of combustible gas flowing into the burner **15** at all times, and not just when the burner is unlit. Accordingly, the user can accurately determine the concentration of natural gas flowing into the burner, even when the burner is ignited.

[0050] In addition to any previously indicated modification, numerous other variations and alternative arrangements may be devised by those skilled in the art without departing from the spirit and scope of this description, and appended claims are intended to cover such modifications and arrangements. Thus, while the information has been described above with particularity and detail in connection with what is presently deemed to be the most practical and preferred aspects, it will be apparent to those of ordinary skill in the art that numerous modifications, including, but not limited to, form, function, manner of operation, and use may be made without departing from the principles and concepts set forth herein. Also, as used herein, the examples and embodiments, in all respects, are meant to be illustrative only and should not be construed to be limiting in any manner.

1. A gas purge burner, comprising:
a gas inlet;
a gas escape vent;
an air inlet located between the gas inlet and the gas escape vent;
a gas outlet located between the gas inlet and the air inlet; and
a substantially continuous ignition mechanism having an igniter disposed near the gas escape vent.

2. The gas purge burner of claim **1**, wherein the igniter comprises a pilot light and the ignition mechanism further comprises a portable container having flammable gas.

3. The gas purge burner of claim **1**, wherein the igniter comprises an electric igniter.

4. The gas purge burner of claim **1**, wherein the gas outlet directs gases from the burner to a gas measurement device.

5. A gas purge burner, comprising:
a burner comprising a gas inlet and a gas escape vent;
a substantially continuous ignition mechanism having an igniter disposed near the gas escape vent;
a gas line extending from the gas inlet to an adjustable gas inlet valve;
a gas outlet disposed between the gas inlet and the adjustable inlet valve; and
a conduit extending from the gas outlet to direct gases from the burner to a gas measurement device.

6. The burner of claim **5**, wherein the igniter comprises an electric igniter.

7. The burner of claim **5**, wherein the igniter comprises a pilot light.

8. The burner of claim **7**, wherein the ignition mechanism comprises a portable container with a flammable gas.

9. The burner of claim **5**, wherein the burner comprises a plurality of gas escape vents.

10. The burner of claim **5**, wherein the gas outlet is disposed between an air inlet defined in the burner and the gas inlet.

11. The burner of claim **5**, wherein the gas measurement device detects the presence of natural gas in the gases that flow from the burner.

12. The burner of claim **5**, wherein the conduit is attached to the gas measurement device and the gas measurement device detects a pressure of gas flowing into the burner.

13. The burner of claim **5**, wherein the conduit directs the gases from the burner to both a gas pressure indicator measuring a pressure of gases flowing into the burner as well as a gas measurement device detecting a concentration of natural gas in the gases that flow into the burner.

14. A gas purge burning system, comprising:
a burner comprising:
a gas inlet and a gas escape vent;
an ignition mechanism having an igniter disposed near the gas escape vent;
a gas line extending from the gas inlet to an adjustable gas inlet valve;
a gas outlet disposed between the gas inlet and the adjustable inlet valve; and
a conduit extending from the gas outlet to direct gases from the burner to a gas measurement device; and
a control apparatus holding the adjustable inlet valve and a connector to attach the conduit to a gas measurement device valve.

15. The system of claim **14**, wherein the control apparatus further comprises a portable container containing a flammable gas.

16. The system of claim **14**, wherein the control apparatus comprises a first coupling to connect the adjustable inlet valve to the gas line.

17. A method for purging gas from a system, comprising:
attaching a burner having a substantially continuous ignition mechanism to a gas system;
igniting the ignition mechanism;
monitoring a concentration of a flammable gas flowing from the gas system into the burner; and
allowing gases from the gas system to pass through the burner until a desired amount of a flammable gas is detected as exiting from the gas system.

18. The method of claim **17**, wherein the burner comprises:
a gas inlet;
a gas escape vent;
an igniter for the ignition mechanism, the igniter disposed near the gas escape vent;
a gas line extending from the gas inlet to an adjustable gas inlet valve; and

a gas outlet disposed between the gas inlet and the adjustable inlet valve.

19. The method of claim **18**, wherein a conduit extends from the gas outlet to direct gases from the burner to a gas measurement device.

20. The method of claim **19**, wherein the gas measurement device measures a pressure of the gases that flow into the burner.

21. The method of claim **19**, wherein the gas measurement device determines a concentration of a flammable gas that flows to the burner.

22. The method of claim **17**, wherein the ignition mechanism comprises an electric igniter and a pilot light that is fed by a container containing a flammable gas.

23. A control apparatus for a gas purge burner, the control apparatus comprising:

a support structure;

an adjustable gas inlet valve attached to the support structure; wherein the inlet valve is attached to a first coupling that connects a pressure valve to a gas line that extends to a gas purge burner and wherein the inlet valve is attached to a second coupling that connects the inlet valve to a gas system; and

a gas measurement valve regulating the flow of gases from the gas purge burner to a gas measurement device, wherein the gas measurement valve is attached to a third coupling connecting a connector to a conduit that extends from a gas outlet disposed between a gas escape vent of the burner and the adjustable inlet valve.

24. The control apparatus of claim **23**, further comprising a fourth coupling that is attached to the support structure, wherein the fourth coupling connects a container of a flammable gas to a pilot light disposed near the gas escape vent of the burner.

25. The control apparatus of claim **23**, further comprising a fourth coupling for connecting an electric igniter of the burner to a power sourced disposed at the control apparatus.

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