STOVE BURNER AND GAS STOVE

BACKGROUND OF INVENTION

Field of the Invention

[0001] The present invention relates to a stove burner including a burner body to receive a fuel gas, a burner head mounted on the burner body, and a gas feeder that feeds the fuel gas to the burner body to burn the fuel gas flowing out through multiple ports in the burner head, and also relates to a gas stove including the stove burner.

Background Art

[0002] A known stove burner includes a cylindrical burner body and a burner head mounted on the burner body. The stove burner ignites a fuel gas flowing out through multiple ports in the burner head to burn the fuel gas. A gas feeder is connected to the burner body to feed the fuel gas from its internal gas feeding path to the burner body.

[0003] Although a typical stove burner includes a gas feeder connected to the side surface of its burner body and thus receives a fuel gas fed from the side surface of the burner body, a large stove burner includes a gas feeder connected to the bottom center of its burner body and receives a fuel gas fed at the bottom center of the burner body. Although a typical stove burner includes a burner body and a gas feeder integral with each other, a large stove burner includes a burner body and a gas feeder separate from each other. ssFor such a large stove burner, a gas feeding path of the gas feeder is aligned with a gas inlet in the burner body, and the gas feeder is connected to the burner body.

[0004] To prevent leakage of a fuel gas, the burner body and the gas feeder have to be placed in tight contact with each other at their connections. For this reason, the gas feeder supports the weights of the burner body and the burner head from below the burner body. The weights of the burner body and the burner head cause the burner body to be pressed against the gas feeder and cause the burner body and the gas feeder to be in tight contact at their connections, thus preventing leakage of a fuel gas (Patent Literatures 1 and 2).

CITATION LIST

PATENT LITERATURE

[0005] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2013-142500

Patent Literature 2: Japanese Unexamined Patent Application Publication No. 2017-125637

SUMMARY OF INVENTION

[0006] For cost reduction or other purposes nowadays, the burner body may be formed of a material such as an aluminum alloy. In continuous and prolonged use with high heat, such a burner body may fail to burn a fuel gas properly for the reason described below.

[0007] A metal such as an aluminum alloy has a lower melting point than a material used before such as brass. In continuous and prolonged use of the stove burner with high heat, the burner head and the burner body reach high temperatures. As described above, a large stove burner includes a gas feeder connected to the bottom center of its burner body to support the weights of the burner body and the burner head. When the burner body reaches a high temperature in, for example, the stove burner in prolonged use with high heat, the bottom of the burner body may deform under the weights of the burner body and the burner head. The burner head may fail to be mounted appropriately on the burner body or may be at a lower position with an insufficient distance to a top table in the gas stove, thus failing to burn a fuel gas properly.

[0008] One or more aspects of the present invention are directed to a stove burner and a gas stove that can burn a fuel gas properly in continuous and prolonged use with high heat.

[0009] One aspect of the present invention provides a stove burner with the structure below. More specifically, the stove burner includes a burner body that receives a fuel gas, a burner head having an annual shape or a disk shape and mounted on the burner body, and a gas feeder including a gas feeding path inside the gas feeder connected to the burner body to feed the fuel gas to the burner body. The stove burner burns the fuel gas flowing out through a plurality of ports in the burner head. The burner body includes an outer cylinder, a bottom plate, a connector, and a deformation restrictor. The outer cylinder has a mount surface at an upper end of the outer cylinder to receive the burner head. The bottom plate includes a bottom

surface of the outer cylinder. The connector is at a center of the bottom plate with the gas feeder being connected to the connector, and includes a gas inlet to receive the fuel gas from the gas feeding path in the gas feeder. The gas feeder is located below the burner body, is connected to the connector, and supports weights of the burner body and the burner head. The deformation restrictor is attached to the bottom plate to reduce deformation of the bottom plate. The deformation restrictor is formed of a material with a higher melting point than a material of the burner body.

[0010] In the stove burner according to the aspect of the present invention, the gas feeder supports the weights of the burner head and the burner body at the position of the connector at the center of the bottom plate. Thus, the bottom plate of the burner body receives a large bending load under the weights of the burner head and the burner body. The deformation restrictor formed of a material with a higher melting point than the material of the burner body is attached to the bottom plate.

[0011] In continuous and prolonged use of the stove burner with high heat, the burner head and the burner body may reach high temperatures. As the burner body reaches a high temperature, the bottom plate also reaches a high temperature. With a metal material typically having a lower strength at a high temperature, the bottom plate may deform under a large bending load. When the bottom plate deforms, the burner head cannot be mounted appropriately on the outer cylinder of the burner body, thus possibly disabling the burner body from burning a fuel gas properly. The deformation restrictor attached to the bottom plate is formed of a material with a higher melting point than the material of the burner body to reduce deformation of the bottom plate. In continuous and prolonged use with high heat, the bottom plate of the burner body is less likely to deform. The burner body can thus burn the fuel gas properly.

[0012] In the stove burner according to the above aspect of the present invention, the deformation restrictor may be attached to a lower surface of the bottom plate.

[0013] In this structure, the deformation restrictor can support, from below, the bottom plate that may deform under the weights of the burner head and the outer cylinder and can easily reduce deformation of the bottom plate of the burner body.

[0014] The stove burner according to the above aspect of the present invention may include a large burner head having an annular shape and a small burner head having a disk shape and a smaller diameter than the large burner head. More specifically, the burner body includes an intermediate cylinder having a smaller diameter than the outer cylinder in the burner body and being coaxial with the outer cylinder, and a small cylinder having a smaller diameter than the intermediate cylinder and being coaxial with the intermediate cylinder. An outside of the intermediate cylinder is coupled with an inside of the small cylinder with a plurality of connecting paths. The bottom plate includes portions defining bottom surfaces of the plurality of connecting paths. The large burner head has an outer circumferential surface including one or more of the plurality of ports in the burner head. The large burner head includes a radially outer portion mounted on the mount surface of the outer cylinder, with a radially inner portion of the large burner head fitted to the intermediate cylinder. The small burner head has an outer circumferential surface including one or more of the plurality of ports in the burner head. The small burner head is mounted on a mount surface of the small cylinder at an upper end of the small cylinder in the burner body. The bottom plate includes an air supply port. The air supply port is located between the plurality of connecting paths on the upper surface of the bottom plate to supply air toward the small burner head. The deformation restrictor has a through-hole or a cut overlapping the air supply port in the bottom plate.

[0015] The stove burner according to the above aspect of the present invention including the large burner head and the small burner head can output high heat and thus is highly likely to reach a high temperature in continuous and prolonged use with high heat. The bottom plate receives a large bending load under the weights of the large burner head and the outer cylinder in the burner body. The stove burner with the above structure includes the deformation restrictor attached to the bottom plate to reduce deformation of the bottom plate of the burner body. This structure can reduce deformation of the burner body in continuous and prolonged use with high heat and can thus burn a fuel gas properly.

[0016] In the stove burner according to the above aspect of the present invention including the large burner head and the small burner head, the burner body may include an upper burner body and a lower burner body in the manner described below. The lower burner body includes

the outer cylinder and the bottom plate. The upper burner body includes the intermediate cylinder, the small cylinder, and a plurality of couplers coupling the intermediate cylinder and the small cylinder. The plurality of connecting paths may be defined by the bottom plate of the lower burner body and the plurality of couplers in the upper burner body in contact with each other, with the upper burner body being mounted on the bottom plate of the lower burner body.

[0017] This structure facilitates manufacture of the stove burner including the large burner head and the small burner head.

[0018] In the stove burner according to the above aspect of the present invention including the upper burner body mounted on the lower burner body, the deformation restrictor being a plate may be located between the upper burner body and the bottom plate of the lower burner body.

[0019] This structure allows the deformation restrictor attached to the bottom plate to be less noticeable to a user of the stove burner who maintains the stove burner. This structure thus prevents the deformation restrictor from degrading the appearance of the stove burner.

[0020] In the stove burner according to the above aspect of the present invention, the burner body may be formed of an aluminum alloy, and the deformation restrictor may be formed of stainless steel.

[0021] To allow manufacture of the burner body with simple processing and with high precision, the burner body is formed of an aluminum alloy. For the deformation restrictor to have a higher melting point, higher corrosion resistance, and smaller deformation in, for example, rapid cooling with a liquid than the material of the burner body, the deformation restrictor is formed of stainless steel.

[0022] The stove burner according to the above aspect of the present invention may be included in a gas stove.

[0023] The gas stove with the above structure can burn a fuel gas properly in continuous and prolonged use with high heat.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] FIG. 1 is an external perspective view of a gas stove 1 according to an embodiment.

FIG. 2 is an external perspective view of a stove burner 10 according to the embodiment installed in the gas stove 1.

FIG. 3 is an exploded view of the stove burner 10 according to the embodiment.

FIG. 4 is a perspective view of a burner body 30, showing the shape of the bottom.

FIG. 5 is an exploded view of the burner body 30.

FIG. 6 is a view of a deformation restrictor 44 with cuts 44c.

FIG. 7 is a vertical sectional view of the stove burner 10 according to the embodiment, showing the burner body 30 connected to a gas feeder 50.

FIGs. 8A and 8B are vertical sectional views of a known stove burner 90 with no deformation restrictor 44.

FIG. 9 is an exploded view of a stove burner 10 according to a first modification.

FIG. 10 is an exploded view of a stove burner 70 according to a second modification.

DETAILED DESCRIPTION

A. Embodiment

[0025] FIG. 1 is an external perspective view of a gas stove 1 according to an embodiment. As illustrated, the gas stove 1 according to the embodiment includes a metal stove body 2 that is rectangular and has an open top, a top table 3 mounted on the stove body 2 to cover the top of the stove body 2, and two stove burners 10 installed in the stove body 2 to have upper portions protruding from openings (not shown) in the top table 3. The top table 3 has knobs 6 for igniting the respective stove burners 10 or for adjusting heat, and trivets 5 surrounding the respective stove burners 10 to allow cookware such as a pot to be placed.

[0026] FIG. 2 is an external perspective view of one stove burner 10 installed in the gas stove 1. As illustrated, each stove burner 10 according to the embodiment includes a burner body 30 mounted on a gas feeder 50 to receive a fuel gas, and a burner head 20 mounted on the burner body 30. The burner head 20 includes an annular large burner head 21, and a disk-shaped small burner head 22 having a smaller diameter than the large burner head 21. The large burner head 21 includes multiple ports 21f, through which a combustion gas flows out, in

its outer circumferential surface. The small burner head 22 includes multiple ports 22f, through which a combustion gas flows out, in its outer circumferential surface.

[0027] FIG. 2 shows a part of the outer circumferential surface of the large burner head 21 in an enlarged manner to show the multiple ports 21f in the outer circumferential surface of the large burner head 21. FIG. 2 also shows a part of the outer circumferential surface of the small burner head 22 in an enlarged manner to show the multiple ports 22f in the outer circumferential surface of the small burner head 22. The large burner head 21 and the small burner head 22 in the embodiment are both formed of forged or cast brass.

[0028] The gas feeder 50 is a casting. The gas feeder 50 includes two gas pipes 51 and 52. The gas pipe 51 with a large diameter (hereafter referred to as a large gas pipe 51) is continuous with the large burner head 21 through the burner body 30. When a fuel gas is ejected into the large gas pipe 51 through a fuel ejection nozzle 51n attached to an open end (not shown) of the large gas pipe 51, the fuel gas flows out through the ports 21f in the outer circumferential surface of the large burner head 21. The gas pipe 52 with a small diameter (hereafter referred to as a small gas pipe 52) is continuous with the small burner head 22 through the burner body 30. When a fuel gas is ejected into the small gas pipe 52 through a fuel ejection nozzle 52n attached to an open end (not shown) of the small gas pipe 52, the fuel gas flows out through the ports 22f in the outer circumferential surface of the small burner head 22. The internal structure of the burner body 30 is described below. The burner body 30 in the embodiment is a die casting of an aluminum alloy. Instead of an aluminum alloy, the burner body 30 may be formed of a zinc alloy, a magnesium alloy, or a copper alloy. Instead of a die casting, the burner body 30 may be formed by forging or casting.

[0029] The stove burner 10 also includes a spark plug 60 adjacent to the large burner head 21, and a flame sensor 61 adjacent to the small burner head 22. The fuel gas flowing out through the multiple ports 21f in the large burner head 21 can be ignited with a spark emitted from the spark plug 60. When the flame successively spreads to adjacent ports 21f, the fuel gas starts burning at the large burner head 21. The large burner head 21 has a spreading port 21g being a slit in the upper surface. The spreading port 21g extends radially. When the large burner head 21 starts burning, the flame spreads to the ports 22f in the small burner head

22 through the spreading port 21g. The flame then also successively spreads to adjacent ports 22f in the small burner head 22, and the fuel gas starts burning at all the ports 22f. After all the ports 22f in the small burner head 22 start burning, the flame sensor 61 detects a flame for determining that the small burner head 22 has started burning.

[0030] FIG. 3 is an exploded view of the stove burner 10 according to the embodiment. As illustrated, the stove burner 10 according to the embodiment includes the burner body 30 mounted on the gas feeder 50, and the burner head 20 mounted on the burner body 30. The burner head 20 includes the annular large burner head 21 and the disk-shaped small burner head 22 having a smaller diameter than the large burner head 21. The large burner head 21 includes a cylindrical wall 21a extending downward in a radially outer portion (or the outer edge), and the cylindrical wall 21a has multiple port grooves 21b in its lower end surface. The port grooves 21b extend through the cylindrical wall 21a and are recessed upward. The large burner head 21 also includes a cylindrical fitting wall 21c extending downward in a radially inner portion (or the inner edge). The small burner head 22 includes a cylindrical wall 22a extending downward in a radially outer portion (or the outer edge), and the cylindrical wall 22a has multiple port grooves 22b in its lower end surface. The port grooves 22b extend through the cylindrical wall 22a and are recessed upward.

[0031] The burner body 30 mainly includes an outer cylinder 32 extending vertically upward from the outer edge of a disk-shaped bottom plate 31, an intermediate cylinder 33 extending vertically upward from a position inward from the outer cylinder 32, and a small cylinder 34 extending vertically upward from a position inward from the intermediate cylinder 33. The intermediate cylinder 33 has a smaller diameter than the outer cylinder 32 and is coaxial with the outer cylinder 32. The small cylinder 34 has a smaller diameter than the intermediate cylinder 33 and is coaxial with the intermediate cylinder 33. The intermediate cylinder 33 and the small cylinder 34 are coupled to each other with four couplers 35 extending radially.

[0032] Each coupler 35 has a connecting path 35a inside the coupler 35 with a first end open in the outer circumferential surface of the intermediate cylinder 33 and a second end open in the inner circumferential surface of the small cylinder 34. The couplers 35 adjacent to each

other define an air supply path 35b that vertically extends through the burner body 30 to supply combustion air to the small burner head 22. The detailed structure of the burner body 30 will be described later.

[0033] The outer cylinder 32 has, at its upper end, a mount surface 32a inclined to be lower radially inward. With the cylindrical wall 21a of the large burner head 21 mounted on the mount surface 32a, the lower ends of the port grooves 21b recessed in the cylindrical wall 21a are closed by the mount surface 32a to define multiple ports 21f in the outer circumferential surface of the cylindrical wall 21a (refer to FIG. 2). Similarly, the small cylinder 34 has, at its upper end, a mount surface 34a inclined to be lower radially inward. With the cylindrical wall 22a of the small burner head 22 mounted on the mount surface 34a, the lower ends of the port grooves 22b recessed in the cylindrical wall 22a are closed by the mount surface 34a to define multiple ports 22f in the outer circumferential surface of the cylindrical wall 22a (refer to FIG. 2).

[0034] The gas feeder 50 has a double-pipe structure and includes a cylindrical inner pipe 54 in a substantially cylindrical body 53. The gas feeder 50 includes the large gas pipe 51 and the small gas pipe 52 extending laterally from the body 53. The small gas pipe 52 has a gas feeding path 52a inside the small gas pipe 52 (hereafter referred to as a small gas feeding path 52a) continuous with the inside of the inner pipe 54. The large gas pipe 51 has a gas feeding path 51a inside the large gas pipe 51 (hereafter referred to as a large gas feeding path 51a) continuous with a space between the body 53 and the inner pipe 54. With reference to FIG. 2, a fuel gas is ejected from the fuel ejection nozzle 51n into the large gas feeding path 51a, and a fuel gas is ejected from the fuel ejection nozzle 52n into the small gas feeding path 52a.

[0035] The body 53 has, at two lateral positions, a mount 55a that protrudes to receive the flame sensor 61, and a mount 55b that protrudes to receive the spark plug 60. The spark plug 60 and the flame sensor 61 are attached to a metal attachment bracket 62. The attachment bracket 62 is attached to the body 53 to have an attachment hole 62a fastened to the mount 55a with an attachment bolt 56, and an attachment hole 62b fastened to the mount 55b with an attachment bolt 56.

[0036] The body 53 has an insertion 53a in an upper portion. The insertion 53a results

from cutting the outer circumferential surface into a cylindrical shape. The body 53 has a contact surface 53b at the upper end of the insertion 53a. The contact surface 53b is cut flat. The inner pipe 54 has a cylindrical contact surface 54a in an upper portion. The contact surface 54a results from cutting the inner circumferential surface. The insertion 53a, the contact surface 53b, and the contact surface 54a are used to connect the gas feeder 50 to the burner body 30.

[0037] FIG. 4 is a perspective view of the burner body 30 viewed upward from obliquely below, showing the shape of the bottom. As illustrated, an annular deformation restrictor 44 is attached to the bottom surface of the burner body 30 with bolts 46. The deformation restrictor 44 allows a cylindrical large connection pipe 38 to protrude through its center. The large connection pipe 38 allows a cylindrical small connection pipe 39 coaxial with the large connection pipe 38 to protrude through its inner space. The outer circumferential surface of the small connection pipe 39 has a diameter fitted to the contact surface 54a (refer to FIG. 3) in the inner pipe 54 in the gas feeder 50. The inner circumferential surface of the large connection pipe 38 has a cylindrical insertion surface 38a, and a planar annular contact target surface 38b located deeper than the insertion surface 38a. The insertion surface 38a has an inside diameter fitted to the cylindrical insertion 53a (refer to FIG. 3) in the upper portion of the body 53 in the gas feeder 50. The large connection pipe 38 and the small connection pipe 39 serve as a connector 37 to connect the gas feeder 50 to the bottom surface of the burner body 30.

[0038] To connect the burner body 30 and the gas feeder 50 to each other, the burner body 30 is positioned to allow the cylindrical small connection pipe 39 protruding from the bottom surface of the burner body 30 to be inserted into the inner pipe 54 in the gas feeder 50 along the cylindrical contact surface 54a (refer to FIG. 3), and the burner body 30 is lowered from above the gas feeder 50. The cylindrical insertion 53a (refer to FIG. 3) in the body 53 in the gas feeder 50 is then inserted into the large connection pipe 38 in the burner body 30 along the cylindrical insertion surface 38a. The burner body 30 is lowered further to cause the contact surface 53b (refer to FIG. 3) at the upper end of the body 53 in the gas feeder 50 to come in contact with the contact target surface 38b located deeper than the insertion surface 38a of the

burner body 30. When the contact surface 53b of the gas feeder 50 is placed into contact with the contact target surface 38b of the burner body 30 in this manner, the contact target surface 38b and the contact surface 53b are placed into tight contact with each other under the weights of the burner body 30 and the burner head 20 (the large burner head 21 and the small burner head 22), and the gas feeder 50 and the burner body 30 are connected to each other in a reliable manner.

[0039] FIG. 5 is an exploded view of the burner body 30. As illustrated, the burner body 30 in the embodiment includes an upper burner body 40 with a smaller diameter mounted on a lower burner body 41 with a larger diameter. The annular deformation restrictor 44 is attached to the bottom surface of the lower burner body 41.

[0040] The upper burner body 40 is a die casting of an aluminum alloy. The upper burner body 40 includes the intermediate cylinder 33 and the small cylinder 34 having a smaller diameter than the intermediate cylinder 33 coupled to each other at four positions with the couplers 35 extending radially. Each coupler 35 has a gutter shape with its bottom surface open. Each coupler 35 has a coupling groove 35c extending radially. The coupling groove 35c extends through the intermediate cylinder 33 at its first end, and extends through the small cylinder 34 at its second end.

[0041] The small cylinder 34 accommodates a disk-shaped partition 34b extending horizontally at substantially the same level as the upper surfaces of the couplers 35. The partition 34b has a gas inlet 39a open at its center. The gas inlet 39a is continuous with the small gas feeding path 52a (refer to FIG. 3). Thus, the space inside the small cylinder 34 above the partition 34b serves as a small burner chamber 36b into which a fuel gas fed from the small gas feeding path 52a flows. The cylindrical small connection pipe 39 (refer to FIG. 4) extends vertically downward from the portion of the partition 34b in which the gas inlet 39a is open.

[0042] The lower burner body 41 is a die casting of an aluminum alloy. The lower burner body 41 includes the outer cylinder 32 extending vertically upward from the outer edge of the disk-shaped bottom plate 31. The bottom plate 31 has a circular gas inlet 43 open at its center. The cylindrical large connection pipe 38 (refer to FIG. 4) extends vertically downward from

the portion of the bottom plate 31 in which the gas inlet 43 is open. The bottom plate 31 has four air supply ports 42a and four attachment holes 42b. The bottom plate 31 has four protrusions 42c on its upper surface. The protrusions 42c protrude to facilitate positioning of the upper burner body 40 with respect to the lower burner body 41.

[0043] To join the upper burner body 40 to the lower burner body 41, the upper burner body 40 is mounted on the bottom plate 31 of the lower burner body 41, and attachment holes (not shown) at four positions in the bottom surface of the upper burner body 40 are aligned with the four attachment holes 42b in the bottom plate 31. This places the spaces between the adjacent couplers 35 in the upper burner body 40 over the air supply ports 42a in the bottom plate 31. In this state, the upper burner body 40 is joined to the lower burner body 41 with the bolts 46 placed from below. The spaces between the adjacent couplers 35 are thus connected to the air supply ports 42a in the bottom plate 31 to define the air supply paths 35b for supplying combustion air to the small burner head 22 (refer to FIG. 3). The coupling groove 35c inside each coupler 35 has its bottom surface closed by a portion of the bottom plate 31 between the adjacent air supply ports 42a to define the connecting path 35a described with reference to FIG. 3.

[0044] When the upper burner body 40 is joined to the lower burner body 41, the deformation restrictor 44 is fastened together with these burner bodies 40 and 41 with the bolts 46. As illustrated in FIG. 5, the deformation restrictor 44 is an annular member having an outside diameter smaller than the inside diameter of the outer cylinder 32 but larger than the outside diameter of the intermediate cylinder 33. The deformation restrictor 44 in the embodiment is formed by blanking a stainless steel sheet. Instead of stainless steel, the deformation restrictor 44 may be formed of any metal with a higher melting point than the materials of the lower burner body 41 and the upper burner body 40.

[0045] The deformation restrictor 44 has a circular through-hole 45 at its center. The through-hole 45 has an inside diameter fitted outside the large connection pipe 38 protruding from the bottom surface of the lower burner body 41. The deformation restrictor 44 also has four through-holes 44a and four attachment holes 44b around the through-hole 45. To attach the deformation restrictor 44 to the bottom surface of the lower burner body 41, the through-

hole 45 is fitted outside the large connection pipe 38 in the lower burner body 41 to align the attachment holes 44b in the deformation restrictor 44 with the attachment holes 42b in the lower burner body 41. The through-holes 44a in the deformation restrictor 44 are aligned with the air supply ports 42a in the lower burner body 41. Attachment holes (not shown) in the upper burner body 40 are also aligned with the four attachment holes 42b in the lower burner body 41. The deformation restrictor 44, the lower burner body 41, and the upper burner body 40 are then joined together with the bolts 46 placed from below. When the deformation restrictor 44 having the through-holes 44a is attached to the bottom surface of the lower burner body 41, the air supply ports 42a in the lower burner body 41 are left unclosed, and thus the air supply paths 35b (refer to FIG. 3) that supply combustion air to the small burner head 22 are left unclosed.

[0046] As shown in FIG. 5, the deformation restrictor 44 in the embodiment has the through-holes 44a. In some embodiments, the deformation restrictor 44 may not have the through-holes 44a but may have any other structure that does not close the air supply ports 42a when the deformation restrictor 44 is attached to the bottom surface of the lower burner body 41. As shown in FIG. 6, for example, the deformation restrictor 44 may have cuts 44c instead of the through-holes 44a.

[0047] FIG. 7 is a vertical sectional view of the stove burner 10 according to the embodiment, showing the burner body 30 mounted on the gas feeder 50. When the burner body 30 is mounted on the gas feeder 50, the contact surface 53b at the upper end of the insertion 53a in the gas feeder 50 is in contact with the contact target surface 38b located deeper than the insertion surface 38a. When the contact surface 53b of the gas feeder 50 is in contact with the contact target surface 38b of the burner body 30, the contact surface 53b supports the weights of the large burner head 21 and the small burner head 22 in addition to the weight of the burner body 30 through the contact target surface 38b, with the contact target surface 38b and the contact surface 53b being in tight contact with each other. In this state, the outer circumferential surface of the small connection pipe 39 is also in tight contact with the contact surface 54a in the inner pipe 54.

[0048] The cylindrical wall 21a extending vertically downward from the outer edge of the

large burner head 21 is mounted on the mount surface 32a at the upper end of the outer cylinder 32. The fitting wall 21c extending vertically downward from the inner edge of the large burner head 21 has its outer circumferential surface in contact with the inner circumferential surface of the intermediate cylinder 33. The outer cylinder 32 and the small cylinder 34 define a large burner chamber 36a to have the bottom closed by the bottom plate 31 and the top closed by the large burner head 21.

[0049] The bottom plate 31 of the burner body 30 and the couplers 35 define the connecting paths 35a. Each connecting path 35a has a first end open inside the small cylinder 34 and a second end open outside the intermediate cylinder 33. Thus, the fuel gas ejected into the large gas feeding path 51a in the large gas pipe 51 (refer to FIG. 3) passes through the connecting paths 35a to be fed to the large burner chamber 36a from the gas inlet 43 defined by the large connection pipe 38 and the small connection pipe 39, and then flows out through multiple ports 21f in the outer circumferential surface of the large burner head 21. The fuel gas ejected into the small gas feeding path 52a in the small gas pipe 52 (refer to FIG. 3) passes through the small connection pipe 39 to be fed to the small burner chamber 36b from the gas inlet 39a, and then flows out through multiple ports 22f in the outer circumferential surface of the small burner head 22. Thus, as described with reference to FIG. 2, the stove burner 10 ignites the fuel gas flowing out through the ports 21f with a spark emitted from the spark plug 60, and starts to burn the fuel gas flowing out through the ports 22f with the flame through the spreading port 21g (refer to FIG. 2). The stove burner 10 according to the embodiment includes the deformation restrictor 44 attached to the bottom surface of the burner body 30 for the reason described below.

[0050] FIG. 8A is a vertical sectional view of a known stove burner 90 with no deformation restrictor 44. The stove burner 90 shown in FIG. 8A has the same structure as the stove burner 10 according to the embodiment described above with reference to FIG. 7 except that it does not include the deformation restrictor 44. As in the stove burner 10 according to the embodiment shown in FIG. 7, the known stove burner 90 shown in FIG. 8A includes the contact surface 53b of the gas feeder 50 supporting the weights of the burner body 30, the large burner head 21, and the small burner head 22 at the position of the contact target surface 38b at the center of the bottom plate 31. The contact surface 53b below the small cylinder 34 in the

burner body 30 and the small burner head 22 directly supports the weights of the small cylinder 34 and the small burner head 22. However, the outer cylinder 32 and the intermediate cylinder 33 in the burner body 30 and the large burner head 21 are located apart radially outward from the contact surface 53b of the gas feeder 50. Thus, the weight of, for example, the large burner head 21 is applied to the contact surface 53b of the gas feeder 50 through the bottom plate 31 (and partially through the couplers 35). Thus, the bottom plate 31 (and the couplers 35) receives a large bending load.

[0051] When the stove burner 10 or the stove burner 90 is in continuous and prolonged use with high heat, the large burner head 21, the small burner head 22, and the upper burner body 40 and the lower burner body 41 in the burner body 30 reach high temperatures. The upper burner body 40 and the lower burner body 41 in the burner body 30 are formed of an aluminum alloy, which has a lower strength at high temperatures. Thus, the bottom plate 31 (and the couplers 35) may be bent under the bending load on the bottom plate 31 (and the couplers 35). FIG. 8B shows the bottom plate 31 and the couplers 35 in a bent state. FIG. 8B shows deformation of the bottom plate 31 and the couplers 35 in an exaggerated manner for easy understanding.

[0052] As shown in FIG. 8B, when the bottom plate 31 and the couplers 35 are bent, the outer cylinder 32 is inclined or lowered and fails to receive the large burner head 21 appropriately. Thus, the stove burner 90 with the ports 21f without its normal shape may fail to burn the fuel gas properly. The bottom plate 31 and the couplers 35 cannot recover their shapes once they are bent, after which the stove burner 90 may thus fail to burn the fuel gas properly.

[0053] In contrast, the stove burner 10 according to the embodiment includes the deformation restrictor 44 attached to the bottom surface of the burner body 30 (refer to FIGs. 5 and 7). The deformation restrictor 44 is formed of a material with a higher melting point (stainless steel in the embodiment) than the materials of the upper burner body 40 and the lower burner body 41 in the burner body 30 (an aluminum alloy in the embodiment). Thus, the deformation restrictor 44 can support the bending load on the bottom plate 31 and the couplers 35 when the stove burner 10 reaches a high temperature and the upper burner body 40 and the

lower burner body 41 have a lower strength. This structure can thus reduce bending of the bottom plate 31 and the couplers 35. Thus, the stove burner 10 can burn a fuel gas properly in continuous and prolonged use with high heat.

B. Modifications

[0054] The stove burner 10 according to the above embodiment may be modified. Such modifications are described briefly below focusing on the differences from the embodiment.

B-1. First Modification

[0055] Although the deformation restrictor 44 in the above embodiment is joined to the lower burner body 41 and the upper burner body 40 with the bolts 46 from below the lower burner body 41, the deformation restrictor 44 in the first modification shown in FIG. 9 is between the upper burner body 40 and the lower burner body 41 and joined to the lower burner body 41 and the upper burner body 40 with the bolts 46. In the stove burner 10 according to the first modification, the deformation restrictor 44 can also support the bending load on the bottom plate 31 and the couplers 35, thus reducing deformation of the bottom plate 31 and the couplers 35.

B-2. Second Modification

[0056] In the above embodiment and the modification, the burner head 20 includes the large burner head 21 and the small burner head 22 with different sizes. The burner head 20 may not include the large burner head 21 and the small burner head 22 and may include a single burner head.

[0057] FIG. 10 is an exploded view of a stove burner 70 according to a second modification including a single burner head 20. As illustrated, the stove burner 70 according to the second modification includes a disk-shaped burner head 20 including a cylindrical wall 20a extending vertically downward from the disk-shaped outer edge. The cylindrical wall 20a has multiple port grooves 20b on the lower surface. The port grooves 20b extend upward.

[0058] As in the burner body 30 in the above embodiment, the burner body 30 in the second modification is also formed of an aluminum alloy. The burner body 30 in the second modification includes an outer cylinder 32 extending vertically upward from the outer edge of

the disk-shaped bottom plate 31. The outer cylinder 32 has a mount surface 32a at the upper end to receive the cylindrical wall 20a of the burner head 20. The bottom plate 31 has a circular gas inlet 43 open at its center. The burner body 30 includes a cylindrical connector 37 protruding downward below the gas inlet 43. As in the large connection pipe 38 in the embodiment described with reference to FIG. 4, the connector 37 has an insertion surface 38a and a contact target surface 38b inside the connector 37. The burner body 30 includes an annular deformation restrictor 44 attached to the bottom surface with bolts 46. As in the above embodiment, the deformation restrictor 44 in the second modification is also formed of a material with a higher melting point (such as stainless steel) than an aluminum alloy.

[0059] The gas feeder 50 in the second modification has the same structure as the gas feeder 50 in the embodiment described above with reference to FIG. 3 except that it excludes the small gas pipe 52 and the inner pipe 54. As in the above embodiment, the gas feeder 50 in the second modification includes a body 53 including a cylindrical insertion 53a and an annular contact surface 53b in its upper portion.

[0060] To mount the burner body 30 on the gas feeder 50, the burner body 30 is positioned to allow the insertion 53a in the body 53 to be inserted into the connector 37 along the insertion surface 38a (refer to FIG. 4), and the burner body 30 is lowered until the contact target surface 38b inside the connector 37 comes into contact with the contact surface 53b at the end of the insertion 53a. Thus, the contact target surface 38b of the burner body 30 is pressed against the contact surface 53b of the body 53 under the weights of the burner body 30 and the burner head 20 to place the contact target surface 38b of the burner body 30 and the contact surface 53b of the body 53 into tight contact with each other.

[0061] The stove burner 70 according to the second modification also includes the outer cylinder 32 located apart radially outward from the contact surface 53b. Thus, the bottom plate 31 of the burner body 30 receives a large bending load under the weights of the outer cylinder 32 and the burner head 20. However, the deformation restrictor 44 attached to the bottom surface of the outer cylinder 32 can reduce deformation of the bottom plate 31. The stove burner 70 can burn a fuel gas properly in continuous and prolonged use with high heat.

[0062] The present embodiment and the modifications have been described. However,

the present invention is not limited to the above embodiment and modifications and may be implemented in various manners without departing from the spirit and scope of the invention.

REFERENCE SIGNS LIST

[0063]

1 gas stove

2 stove body

3 top table

5 trivet

6 knob

10 stove burner

20 burner head

20a cylindrical wall

20b port groove

21 large burner head

21a cylindrical wall

21b port groove

21c fitting wall

21f port

21g spreading port

22 small burner head

22a cylindrical wall

22b port groove

22f port

30 burner body

31 bottom plate

32 outer cylinder

32a mount surface

33 intermediate cylinder

34 small cylinder

34a mount surface

34b partition

35 coupler

35a connecting path

35b air supply path

35c coupling groove

36a large burner chamber

36b small burner chamber

37 connector

38 large connection pipe

38a insertion surface

38b contact target surface

39 small connection pipe

39a gas inlet

40 upper burner body

41 lower burner body

42a air supply port

42b attachment hole

42c protrusion

43 gas inlet

44 deformation restrictor

44a through-hole

44b attachment hole

44c cut

45 through-hole

46 bolt

50 gas feeder

51 large gas pipe

51a large gas feeding path

51n fuel ejection nozzle

52 small gas pipe

52a small gas feeding path

52n fuel ejection nozzle

53 body

53a insertion

53b contact surface

54 inner pipe

54a contact surface

55a mount

55b mount

56 attachment bolt

60 spark plug

61 flame sensor

62 attachment bracket

62a attachment hole

62b attachment hole

70 stove burner

90 stove burner

CLAIMS

1. A stove burner, comprising:

a burner body configured to receive a fuel gas;

a burner head having an annual shape or a disk shape, the burner head being mounted on the burner body; and

a gas feeder including a gas feeding path inside the gas feeder, the gas feeding path being connected to the burner body to feed the fuel gas to the burner body,

wherein the stove burner burns the fuel gas flowing out through a plurality of ports in the burner head, and

the burner body includes

an outer cylinder having a mount surface at an upper end of the outer cylinder to receive the burner head,

a bottom plate including a bottom surface of the outer cylinder,

a connector at a center of the bottom plate with the gas feeder being connected to the connector, the connector including a gas inlet to receive the fuel gas from the gas feeding path in the gas feeder, the gas feeder being located below the burner body, being connected to the connector, and supporting weights of the burner body and the burner head, and

a deformation restrictor attached to the bottom plate to reduce deformation of the bottom plate, the deformation restrictor comprising a material with a higher melting point than

a material of the burner body.

2. The stove burner according to claim 1, wherein

the deformation restrictor is attached to a lower surface of the bottom plate.

3. The stove burner according to claim 1, wherein

the burner body includes

an intermediate cylinder having a smaller diameter than the outer cylinder in the burner body and being coaxial with the outer cylinder,

a small cylinder having a smaller diameter than the intermediate cylinder and being coaxial with the intermediate cylinder, and

a plurality of connecting paths connecting an outer space of the intermediate cylinder with an inner space of the small cylinder,

the burner head includes

a large burner head having an annular shape, the large burner head including a radially outer portion of the annular shape mounted on the mount surface of the outer cylinder, a radially inner portion of the annular shape fitted to the intermediate cylinder, and an outer circumferential surface including one or more of the plurality of ports in the burner head, and

a small burner head having a disk shape and having a smaller diameter than the large burner head, being mounted on a mount surface of the small cylinder at an upper end of the small cylinder, and having an outer circumferential surface including one or more of the

plurality of ports in the burner head,

the bottom plate of the burner body includes portions defining bottom surfaces of the plurality of connecting paths,

the bottom plate includes an air supply port, the air supply port being located between the plurality of connecting paths to supply air toward the small burner head, and

the deformation restrictor has a through-hole or a cut overlapping the air supply port in the bottom plate.

4. The stove burner according to claim 3, wherein

the burner body includes

a lower burner body including the outer cylinder and the bottom plate, and

an upper burner body including the intermediate cylinder, the small cylinder, and a plurality of couplers coupling the intermediate cylinder and the small cylinder, the upper burner body being mounted on the bottom plate of the lower burner body, and

the plurality of connecting paths are defined by the bottom plate and the plurality of couplers in contact with each other, with the upper burner body being mounted on the bottom plate of the lower burner body.

5. The stove burner according to claim 4, wherein

the deformation restrictor is a plate located between the upper burner body and the bottom plate of the lower burner body.

6. The stove burner according to any one of claims 1 to 5, wherein

the burner body comprises an aluminum alloy, and

the deformation restrictor comprises stainless steel.

7. A gas stove, comprising:

the stove burner according to any one of claims 1 to 5.