

DESCRIPTION

Title of Invention: Cooking Stove Burner

Technical Field

[0001] The present invention relates to a cooking stove burner (i.e., a burner for use in a cooking stove) which is provided with two-stage burner ports arranged in upper stage and lower stage in a manner to open along an outer peripheral surface of a burner head mounted on a burner body.

[0002] As this kind of cooking stove burner, there is known one which is switchable between a state in which gas is supplied only to the lower-stage burner ports and a state in which the gas is supplied also to the upper-stage burner ports such that carry over occurs from the lower-stage burner ports to the upper-stage burner ports upon start of gas supply to the upper-stage burner ports. In this arrangement, there is an advantage in that the heating power is adjustable over a wide range between low heat of combustion in which the combustion takes place only in the lower-stage burner ports and high heat of combustion in which the combustion takes place in both the lower-stage burner ports and the upper-stage burner ports.

[0003] By the way, the burner body generally has a triple tubular body made up of an outer tubular body, an intermediate tubular body, and an inner tubular body. The burner head is constituted by an annular lower head member having, on an inner peripheral part thereof, a vertically disposed tubular part so as to be fitted into the intermediate tubular body of the burner body, and an annular upper head member having, on an inner peripheral part thereof, a vertically disposed tubular part so as to be fitted into the inner tubular body of the burner body. The lower-stage burner ports are defined between the outer tubular body of the burner body and the lower head member, and the upper-stage burner ports are defined between the lower head member and the upper head member. In concrete, an annular wall on which the upper head member is seated is disposed in a

vertically upward manner along an upper surface peripheral part of the lower head member. This annular wall has formed therein, at a circumferential distance from one another, a plurality of grooves which become (or form) the upper-stage burner ports recessing downward from an upper end of the annular wall.

[0004] It is to be noted here that the grooves which become the upper-stage burner ports to be formed in the annular wall is made into the shape of a trapezoid with a draft (i.e., a taper) for pulling out the groove-forming die upward, i.e., into the shape of a trapezoid having a narrower bottom and a wider top. The width at the bottom of the groove forming die must be made into a certain amount of dimension necessary to secure strength. As a result, the bottom width of the trapezoid which is the shape of the grooves cannot be set to such a smaller dimension as compared with the flame-out distance. Therefore, the width of the upper bottom, i.e., the width of the upper end of the upper-stage burner ports will have to be larger than the flame-out distance. In this kind of cooking stove burner, if the vertical distance between the upper-stage burner ports and the lower-stage burner ports is small, at the time of carry over of flame from the lower-stage burner ports to the upper-stage burner ports, flash back at the upper-stage burner ports is likely to occur. The reason for the above phenomenon is as follows. Namely, after having started the gas supply to the upper-stage burner ports, it takes a certain time for the gas ejection speed from the upper-stage burner ports to exceed the combustion speed. On the other hand, in case the vertical distance between the upper-stage burner ports and the lower-stage burner ports is small, the time becomes shorter from the start of gas supply to the upper-stage burner ports to the occurrence of carry over to the upper-stage burner ports. Then, carry over occurs before the gas ejection speed out of the upper-stage burner ports increases to exceed the combustion speed, and flash back will occur at that upper end of the upper-stage burner ports which is larger in width than the flame-out distance.

[0005] There is known, in JP-2012-127563 A, a cooking stove burner in which the vertical distance between the upper-stage burner ports and the lower-stage burner ports is made larger. According to this arrangement, it takes time from the start of gas supply to the upper-stage burner ports to the occurrence of carry over to the upper-stage burner ports. Therefore, before carry over to the upper-stage burner ports, the gas ejection speed from the upper-stage burner ports will exceed the combustion speed. As a result, flash back at the time of carry over can be prevented from occurring at that upper end of the upper-stage burner ports which is larger in width than the flame-out distance. However, if the vertical distance between the upper-stage burner ports and the lower-stage burner ports is made larger, the burner will become larger in size.

SUMMARY OF THE INVENTION

Problems that the Invention is to Solve

[0006] In view of the above points, this invention has a problem of providing a cooking stove burner in which the flash back at the time of carry over to the upper-stage burner ports can be restrained from occurring without enlarging the burner in size.

Means of Solving the Problems

[0007] In order to solve the above problems, this invention is a cooking stove burner having two-stage burner ports arranged in upper stage and lower stage. The burner ports are open along an outer peripheral surface of a burner head mounted on a burner body. The burner is switchable between a state in which gas is supplied only to the lower-stage burner ports and a state in which the gas is supplied also to the upper-stage burner ports such that carry over occurs from the lower-stage burner ports to the upper-stage burner ports upon start of gas supply to the upper-stage burner ports. The burner body has a triple tubular body made up of an outer tubular body, an intermediate tubular body, and an inner tubular body.

The burner head is constituted by: an annular lower head member having, on an inner peripheral part thereof, a vertically disposed tubular part so as to be fitted into the intermediate tubular body of the burner body; and an annular upper head member having, on an inner peripheral part thereof, a vertically disposed tubular part so as to be fitted into the inner tubular body of the burner body. The lower-stage burner ports are defined between the outer tubular body of the burner body and the lower head member, and the upper-stage burner ports are defined between the lower head member and the upper head member. The cooking stove burner is characterized in: that a first annular wall is disposed in a vertically upward manner along an upper surface peripheral part of the lower head member, and along a lower surface peripheral part of the upper head member, a second annular wall, which is seated on the first annular wall, is disposed in a vertically downward manner; that the upper-stage burner ports are divided into two portions of upper burner port portions and lower burner port portions; that the first annular wall has formed therein a plurality of grooves which become the lower burner port portions by being recessed from the upper end of the first annular wall downward at a circumferential distance from one another; and that the second annular wall has formed therein a plurality of grooves which become the upper burner port portions by being recessed from the lower end of the second annular wall upward at a circumferential distance from one another and further at a circumferential positional deviation relative to the grooves which become the lower burner port portions.

[0008] According to this invention, since the upper-stage burner ports are divided into two portions of the upper burner port portions and the lower burner port portions, the depth of recessing of the grooves to be formed in each of the first and the second annular walls will be reduced to one half as compared with the case in which the upper-stage burner ports are not divided into two vertically divided portions. It follows that, because the groove-forming die for fabricating the grooves must be provided with a draft, those portions of the grooves which become the widest, i.e., the width of the

upper end parts of the grooves that become the lower burner port portion to be formed in the first annular wall, and the width of the lower end parts of the grooves that become the upper burner port portion to be formed in the second annular wall, can be made smaller than the flame-out distance. As a result, flash back can be prevented at the time of carry over in the lower burner port portions or the upper burner port portions of the upper-stage burner ports even if the vertical distance between the lower burner port portion of the upper-stage burner ports and the lower-stage burner ports is made shorter in order not to make the burner larger in size and, therefore, the time required for the carry over from the lower-stage burner ports to the upper-stage burner ports is shortened, so that carry over occurs before the ejection speed of the gas out of the lower burner port portions or the upper burner port portions of the upper-stage burner ports exceeds the combustion speed. Furthermore, since the upper burner port portions and the lower burner port portions of the upper-stage burner ports are arranged in a staggered manner, the gas to be independently ejected out of the upper burner port portions and the lower burner port portions can be supplied with sufficient secondary air from the surroundings thereof. As a result, the flame to be formed in the upper-stage burner ports becomes a shortened flame, and the overflowing of the flame outward of the bottom of a pan can also be restrained.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a perspective view of a cooking stove burner according to an embodiment of this invention.

FIG. 2 is a sectional view of the cooking stove burner according to this embodiment.

FIG. 3 is an enlarged side view of an essential part of the cooking stove burner according to the embodiment.

FIG. 4 is a graph showing the change in amount of gas to be supplied to the lower-stage burner ports and the upper-stage burner ports.

MODES FOR CARRYING OUT THE INVENTION

[0010] With reference to FIGS. 1 and 2, reference numeral 1 denotes a cooking stove burner according to an embodiment of this invention. This burner 1 has a burner body 2 and a burner head 3 on the burner body 2. On an outer peripheral surface of the burner head 3 there are vertically arranged two stages of upper-stage burner ports 4U and lower-stage burner ports 4L, in a plurality of pieces, respectively at a circumferential distance from one another. By the way, in a plurality of those portions at circumferential points of the burner head 3 which are positioned in the same direction as those of a plurality of grate claws provided with a grate disposed on a cooking stove top plate, only the lower-stage burner ports 4L are formed without forming the upper-stage burner ports 4U, in order to prevent the flame from coming into contact with the grate claws because this contact will cause incomplete combustion.

[0011] In more detailed explanation, the burner body 2 has a triple tubular body made up of an outer tubular body 21, an intermediate tubular body 22, and an inner tubular body 23. The outer tubular body 21 is provided with a skirt part 21a which extends downward from an outer periphery of the upper end of the outer tubular body 21. The burner head 3 is constituted by: an annular lower head member 31 having, on an inner peripheral part thereof; a vertically disposed tubular part 31a so as to be fitted into the intermediate tubular body 22 of the burner body 2; and an annular upper head member 32 having, on an inner peripheral part thereof, a vertically disposed tubular part 32a so as to be fitted into the inner tubular body 23 of the burner body 2. The lower-stage burner ports 4L are defined between the outer tubular body 21 of the burner body 2 and the lower head member 31, and the upper-stage burner ports 4U are defined between the lower head member 31 and the upper head member 32.

[0012] The upper-stage burner ports 4U are divided into two portions of the upper burner port portions 4Ua and lower burner port portions 4Ub.

In concrete, along an upper surface peripheral part of the lower head member 31, a first annular wall 33 is disposed in a vertically upward manner, and along a lower surface peripheral part of the upper head member 32, a second annular wall 34, which is seated on the first annular wall 33, is disposed in a vertically downward manner. Then, the first annular wall 33 has formed therein a plurality of grooves at a circumferential distance from one another. The grooves are arranged to form the lower burner port portions 4Ub of the upper-stage burner ports 4U in a manner to be recessed from the upper end of the first annular wall 33 downward of the first annular wall 33. Further, the second annular wall 34 has formed therein a plurality of grooves at a circumferential distance from one another. The grooves are arranged to form the upper burner port portions 4Ua of the upper-stage burner ports 4U, and also at a circumferential positional deviation relative to the grooves which become the lower burner port portion 4Ub. According to this arrangement, the upper burner port portions 4Ua and the lower burner port portions 4Ub will be disposed in a staggered manner relative to each other with a circumferential positional deviation.

[0013] With reference to FIG. 3, the grooves which become the lower burner port portions 4Ub to be formed in the first annular wall 33 will be a trapezoid in shape with a larger upper bottom width than a lower bottom width because a draft for pulling out the groove-forming die upward is provided. The grooves which become the upper burner port portions 4Ua to be formed in the second annular wall 34 will be of a trapezoidal shape with a larger lower bottom than the upper bottom because the draft for pulling out the groove-forming die is provided. Here, by dividing the upper-stage burner ports 4U into two portions of the upper burner port portions 4Ua and the lower burner port portions 4Ub, the depth of recessing of the grooves to be formed in each of the first annular wall 33 and the second annular wall 34 will be reduced to one half as compared with the case in which the upper-stage burner ports 4U are not divided into two. Therefore, the width of those portions of the grooves which become the largest in width because

the grooves must be provided with the draft for pulling out the groove-forming die, i.e., the width of the upper end parts of the grooves which become the lower burner port portions 4Ub to be formed in the first annular wall 33, and the width of the lower end parts of the grooves which become the upper burner port portions 4Ua to be formed in the second annular wall 34, can both be made below the flame-out distance (e.g., 1.2 mm).

[0014] The lower surface peripheral part of the lower head member 31 is provided, in a manner to extend vertically downward, with a third annular wall 35 that is arranged to be seated on the upper end part of the outer tubular body 21 of the burner body 2. The third annular wall 35 has formed therein, at a circumferential distance from one another, a plurality of grooves which become the lower-stage burner ports 4L to be recessed from the lower end of the third annular wall 35 upward. Further, at one circumferential position of the lower head member 31, target part 36 which lies opposite to an ignition electrode (not illustrated) is provided in a projecting manner. By means of spark between the ignition electrode and the target part 36, ignition occurs to the lower-stage burner ports 4L.

[0015] In addition, the burner 1 is provided with: that first mixing tube 5U for the upper-stage burner ports 4U which is in communication with the space between the intermediate tubular body 22 and the inner tubular body 23 of the burner body 2; and that second mixing tube 5L for the lower-stage burner ports 4L which is in communication with the space between the outer tubular body 21 and the intermediate tubular body 22 of the burner body 2. The first mixing tube 5U is supplied with fuel gas through a first branch passage 6U that is branched from a common gas supply passage 6. The second mixing tube 5L is supplied with fuel gas through a second branch passage 6L that is branched from the gas supply passage 6. Then, within each of the first and the second mixing tubes 5U, 5L, the fuel gas and the primary air that is suctioned into each of the mixing tubes 5U, 5L get mixed together, and the mixture gas from the first mixing tube 5U is ejected out of the upper-stage burner ports 4U through the space

between the intermediate tubular body 22 and the inner tubular body 23 as well as through the space between the lower head member 31 and the upper head member 32. Further, the mixture gas from the second mixing tube 5L is ejected out of the lower-stage burner ports 4L through the space between the outer tubular body 21 and the intermediate tubular body 22 of the burner body 2, as well as through the space between the outer tubular body 21 and the lower head member 3.

[0016] The gas supply passage 6 is provided with a main valve 7 which opens at the time of ignition and closes at the time of extinction. Each of the first and the second branch passages 6U, 6L has interposed therein each of the first and the second flow adjusting valves 8U, 8L whose opening degrees vary in interlocking with an operation member made up of a lever and a knob (not illustrated) for adjusting the heating power. The operation member is arranged to be operable from the low heat position to the high heat position. When the operation member is operated from the low heat position to the high heat position, the opening degree of the second flow control valve 8L gradually increases from the minimum opening degree. Then, the amount of gas supply to the lower-stage burner ports 4L will gradually increase, as shown by line “a” in FIG. 4, from a predetermined minimum amount Q_{Lmin} required to prevent flash back at the lower-stage burner ports 4L toward the maximum amount Q_{Lmax} . On the other hand, the first flow control valve 8U is not opened until the operation member reaches a predetermined medium position. When the operation member has exceeded the medium position, the first flow control valve suddenly opens to a predetermined opening degree and, as a result of subsequent operation to the high heat position, the opening degree will gradually increase. When the operation member is operated from the low heat position to the high heat position, as shown by line “b” in FIG. 4, the upper-stage burner ports 4U will not be supplied with gas until the operation member reaches the medium heat position. Once the operation member has moved beyond the medium heat position, the amount of gas supply to the

upper-stage burner ports 4U suddenly increases to the predetermined minimum amount Q_{Umin} and, thereafter, gradually increases to the maximum amount Q_{Umax} .

[0017] In case combustion is intended to occur also in the upper-stage burner ports 4U, the operation member is operated beyond the medium heat position to the side of high heat position so that the gas supply to the upper-stage burner ports 4U is started, thereby causing carry over to occur from the lower-stage burner ports 4L to the upper-stage burner ports 4U. In this embodiment, the width of the upper end part of that portion with largest width of the grooves which becomes the lower burner port portion 4Ub of the upper-stage burner ports 4U, and the width of the lower end part of that portion with largest width of the grooves which becomes the upper burner port portions 4Ua of the upper-stage burner ports 4U, can be made below the flame-out distance as described above. Further, in this embodiment, in order not to incur the necessity of enlarging the burner 1, the vertical distance between the lower burner port portions 4Ub of the upper-stage burner ports 4U and the lower-stage burner ports 4L has been shortened. For this reason, the time required for the carry over from the lower-stage burner ports 4L to the upper-stage burner ports 4U is shortened. As a result, there are cases where carry over may occur before the ejection speed of the gas out of the lower burner port portions 4Ub of the upper-stage burner ports 4U and the upper burner port portions 4Ua exceeds the combustion speed. However, in this embodiment, that upper end of the largest width of grooves which become the lower burner port portions 4Ub, and that lower end of the largest width of grooves which become the upper burner port portions 4Ua can be made below the flame-out distance as described above. Therefore, even if carry over may occur before the ejection speed of the gas out of the lower burner port portions 4Ub and the upper burner port portions 4Ua exceeds the combustion speed, there will occur no flash back at the time of carry over at the lower burner port portions 4Ub and the upper burner port portions 4Ua.

[0018] In addition, the upper burner port portions 4Ua and the lower burner port portions 4Ub are positionally disposed in a staggered manner relative to each other. Therefore, sufficient secondary air can be supplied from the surroundings to the gas that is ejected independently out of the upper burner port portions 4Ua and the lower burner port portions 4Ub. As a result, the flames to be formed in the upper-stage burner ports 4U is converted to shorter flames even under the high heat state, and the flame overflowing along the bottom of a pan can be prevented from occurring.

[0019] Descriptions have so far been made of the embodiment of this invention with reference to the accompanying drawings. This invention shall, however, be not restricted to the above, but is capable of carrying into effect by introducing various modifications within a scope in which the gist of this invention is not deviated.

Explanation of Reference Characters

[0020]

- 1 cooking stove burner (i.e., burner for use in cooking stove)
- 2 burner body
- 21 outer tubular body
- 22 intermediate tubular body
- 23 inner tubular body
- 3 burner head
- 31 lower head member
- 31a tubular part of lower head member
- 32 upper head member
- 32a tubular part of upper head member
- 33 first annular wall
- 34 second annular wall
- 4U upper-stage burner ports
- 4Ua upper burner port portions
- 4Ub lower burner port portions

4L lower-stage burner ports

CLAIMS

[Claim 1] A cooking stove burner having two-stage burner ports arranged in upper stage and lower stage, said burner ports being open along an outer peripheral surface of a burner head mounted on a burner body, said burner being switchable between a state in which gas is supplied only to the lower-stage burner ports and a state in which the gas is supplied also to the upper-stage burner ports such that carry over occurs from the lower-stage burner ports to the upper-stage burner ports upon start of gas supply to the upper-stage burner ports, wherein:

 the burner body has a triple tubular body made up of an outer tubular body, an intermediate tubular body, and an inner tubular body;

 the burner head is constituted by: an annular lower head member having, on an inner peripheral part thereof, a vertically disposed tubular part so as to be fitted into the intermediate tubular body of the burner body; and an annular upper head member having, on an inner peripheral part thereof, a vertically disposed tubular part so as to be fitted into the inner tubular body of the burner body;

 the lower-stage burner ports are defined between the outer tubular body of the burner body and the lower head member, and the upper-stage burner ports are defined between the lower head member and the upper head member,

 wherein the cooking stove burner is characterized in:

 that a first annular wall is disposed in a vertically upward manner along an upper surface peripheral part of the lower head member, and along a lower surface peripheral part of the upper head member, a second annular wall, which is seated on the first annular wall, is disposed in a vertically downward manner;

 that the upper-stage burner ports are divided into two portions of upper burner port portions and lower burner port portions;

 that the first annular wall has formed therein a plurality of grooves which become the lower burner port portions by being recessed from the

upper end of the first annular wall downward at a circumferential distance from one another; and

that the second annular wall has formed therein a plurality of grooves which become the upper burner port portions by being recessed from the lower end of the second annular wall upward at a circumferential distance from one another and further at a circumferential positional deviation relative to the grooves which become the lower burner port portions.