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(54) **BURNER ELEMENT, BURNER, AND GAS WATER HEATER**

(57) The present disclosure discloses a fire grate, a burner, and a gas water heater. The fire grate includes a fire grate body and a flame stabilizer. The fire grate body has a main gas channel formed therein. A main gas outlet is formed at top of the fire grate body and in communication with the main gas channel, and a communication opening is formed at a side of the fire grate body and in communication with the main gas channel. The flame stabilizer is disposed outside the fire grate body and forms an auxiliary gas channel together with the fire grate body. The auxiliary gas channel is in communication with the communication opening. The flame stabilizer also has an auxiliary gas outlet formed at a top of the flame stabilizer and in communication with the auxiliary gas channel.

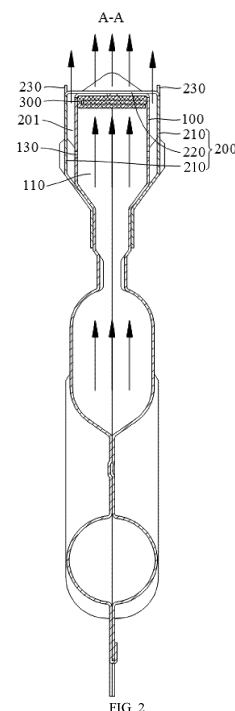


FIG. 2

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Description

[0001] This application claims priority to Chinese Patent Application No. 202222286219.5, filed on August 29, 2022, the disclosures of which are hereby incorporated by reference in their entireties.

FIELD

[0002] The present disclosure relates to the field of hot water devices, and in particular, to a fire grate, a burner, and a gas water heater.

BACKGROUND

[0003] A gas water heater is a gas appliance that uses fuel gas as a fuel and combusts a mixture of air and fuel gas within a combustion chamber through a burner to generate high-temperature flue gas and exchanges heat with cold water in a heat exchanger through a high-temperature flue-gas-flow heat exchanger for achieving the purpose of producing hot water, and is widely employed due to its convenience in use, rapid hot water preparation, and other advantages. The burner in the prior art is unfavorable for meeting requirements of low nitrogen emission performance.

SUMMARY

[0004] A main objection of the present disclosure is to provide a fire grate, which aims to lower a combustion intensity of the fire grate to improve smoke performance of instantaneous combustion emission and to lower nitrogen oxides generated during combustion.

[0005] To achieve the above objection, a fire grate provided in the present disclosure comprises a fire grate body and a flame stabilizer. The fire grate body has a main gas channel formed therein. A main gas outlet is formed at a top of the fire grate body and in communication with the main gas channel, and a communication opening is formed at a side of the fire grate body and in communication with the main gas channel. The flame stabilizer is disposed outside the fire grate body and forms an auxiliary gas channel together with the fire grate body. The auxiliary gas channel is in communication with the communication opening. An auxiliary gas outlet is formed at a top of the flame stabilizer and communicates with the auxiliary gas channel.

[0006] In an embodiment of the present disclosure, the flame stabilizer comprises two first connectors arranged opposite to each other and connected to the fire grate body.

[0007] In an embodiment of the present disclosure, the communication opening is formed on each of two opposite sides of the fire grate body.

[0008] In an embodiment of the present disclosure, one of the two first connectors forms the auxiliary gas channel with its corresponding side of the fire grate body, and the auxiliary gas outlet is formed at a top of the first connector and communicates with the corresponding auxiliary gas channel.

[0009] In an embodiment of the present disclosure, the flame stabilizer further comprises a plurality of second connectors arranged at an interval in a longitudinal direction of the fire grate body.

[0010] In an embodiment of the present disclosure, two ends of the plurality of second connectors are connected respectively to the tops of the two first connectors.

[0011] In an embodiment of the present disclosure, the flame stabilizer is sleeved on the fire grate body.

[0012] In an embodiment of the present disclosure, the plurality of second connectors is connected to the top of the fire grate body and arranged to avoid interference with the main gas outlet.

[0013] In an embodiment of the present disclosure, the top of the first connector is spaced apart from the corresponding side of the fire grate body.

[0014] In an embodiment of the present disclosure, the main gas outlet comprises a plurality of first fire holes arranged at an interval in the longitudinal direction of the fire grate body.

[0015] In an embodiment of the present disclosure, a partition is disposed between two adjacent ones of the plurality of first fire holes, and one of the plurality of second connectors is correspondingly connected to the partition.

[0016] In an embodiment of the present disclosure, the main gas outlet further comprises a plurality of second fire holes formed in the partition, and the plurality of second fire holes is arranged in a rectangular array.

[0017] In an embodiment of the present disclosure, the plurality of second fire holes is arranged at an interval in a transverse direction of the fire grate.

[0018] In an embodiment of the present disclosure, the fire grate further comprises a combustion panel configured as a metal net structure and fixedly connected to the partition.

[0019] In an embodiment of the present disclosure, the combustion panel is disposed at a side of the partition facing away from the second connector.

[0020] In an embodiment of the present disclosure, the combustion panel is disposed between the partition and the second connector, and the second connectors are connected to the partition through the combustion panel.

[0021] In an embodiment of the present disclosure, the combustion panel is an integrally formed and bent multi-layer metal net structure ; or the combustion panel comprises multiple layers of metal nets arranged in a laminated structure, and a buffer cavity is formed between two adjacent layers of metal nets.

[0022] In an embodiment of the present disclosure, the fire grate body has a plurality of communication openings formed at the side of the fire grate body. The plurality of communication openings is arranged at an interval in a longitudinal direction of the fire grate body. The auxiliary gas channel correspondingly extends in the longitudinal direction of the fire grate body.

[0023] The present disclosure further provides a burner, comprising the fire grate as described above.

[0024] The present disclosure further provides a gas water heater, comprising the burner as described above.

[0025] In the technical solution of the present disclosure, the flame stabilizing member is additionally provided at an outer side of the fire grate body, to increase the auxiliary gas channel at the outer side of the fire grate body. The auxiliary gas channel is in communication with the main gas channel through the communication opening at the side of the fire grate body. The main gas outlet of the main gas channel and the auxiliary gas outlet of the auxiliary gas channel together form a fire hole of the fire grate. After a gas flow is conveyed to the main gas channel, part of the gas flow enters the auxiliary gas channel through the communication opening. The gas flow is shunted through the auxiliary gas channel to reduce a gas outlet amount of the main gas outlet, which reduces a combustion intensity of a main gas opening. Moreover, the auxiliary gas outlet of the auxiliary gas channel is equivalent to increasing a fire hole area of the fire grate. In this way, the combustion intensity of the fire grate is lowered, which is beneficial to ensuring a sufficient degree of the gas flow in the fire hole. Therefore, the smoke performance of instantaneous combustion emission can be improved, and the nitrogen oxides generated by combustion are reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] In order to clearly explain technical solutions according to embodiments of the present disclosure or in the related art, drawings used in the description of the embodiments or the related art are briefly described below. Obviously, the drawings described below are merely some embodiments of the present disclosure. Based on these drawings, other drawings can be obtained by those skilled in the art without creative effort.

FIG. 1 is a front view of an embodiment of a fire grate according to the present disclosure.

FIG. 2 is a cross-sectional view taken along line A-A in FIG. 1 according to an embodiment.

FIG. 3 is a partial cross-sectional structural view taken along line A-A in FIG. 1 according to another embodiment.

FIG. 4 is a partial cross-sectional structural view taken along line A-A in FIG. 1 according to yet another embodiment.

FIG. 5 is a top view of a fire grate according to according to an embodiment of the present disclosure.

FIG. 6 is a top view of a fire grate according to according to another embodiment of the present disclosure.

FIG. 7 is a top view of a fire grate according to according to yet another embodiment of the present disclosure.

Description of Reference Numerals:

[0027]

Numerals	Name	Numerals	Name
100	fire grate body	201	auxiliary gas channel
110	main gas channel	202	auxiliary gas outlet
120	main gas outlet	210	first connector
121	first fire hole	211	fixed-connection protruding portion
122	second fire hole	220	second connector
130	communication opening	230	rectification rack
140	partition	231	fixation member
150	welding engagement section	300	combustion panel
160	blocking protrusion	310	buffer cavity
200	flame stabilizer		

[0028] The implementation, functional characteristics, and advantages of the present disclosure will be further described in combination with the embodiments and with reference to the accompanying drawings.

DETAILED DESCRIPTION

[0029] Technical solutions according to embodiments of the present disclosure will be described clearly and completely below in combination with accompanying drawings of the embodiments of the present disclosure. Obviously, the embodiments described below are only a part of the embodiments of the present disclosure, rather than all embodiments of the present disclosure. On a basis of the embodiments of the present disclosure, all other embodiments obtained by those skilled in the art without creative labor shall fall within the protection scope of the present disclosure.

[0030] It should be noted that, when the embodiments of the present disclosure relate to directional indication (such as up, down, left, right, front, and back, etc.), the directional indication is only configured to explain a relative position relationship, a motion situation, etc. between components in a predetermined specific posture. When the specific posture changes, the directional indication also changes accordingly.

[0031] Terms such as "connected to," "installation," "fixed" and the like should be understood in a broad sense. For example, "connection" may be a fixed connection or a detachable connection or an integral connection; may be directly or indirectly connected through an intermediate. For those of ordinary skill in the art, the specific meaning of the above-mentioned terms in the present disclosure can be understood according to specific circumstances.

[0032] In addition, when the embodiments of the present disclosure relate to terms such as "first" and "second," the terms such as "first" and "second" are used herein for purposes of description and are not intended to indicate or imply relative importance or significance, or implicitly indicate the number of indicated technical features. Furthermore, the feature associated with "first" and "second" may comprise one or more this feature distinctly or implicitly. In addition, when the meaning of "and/or" appearing through the disclosure is, comprising three parallel solutions. Taking "A and/or B" as an example, comprising solution A, or solution B, or solutions A and B satisfied at the same time. In addition, the technical solutions between the various embodiments may be combined with each other, but must be based on those of ordinary skill in the art. Further, when the combination of the technical solutions is contradictory or cannot be implemented, it should be regarded that the combination of the technical solutions does not exist, nor is within the scope of the present disclosure.

[0033] The present disclosure provides a fire grate.

[0034] In an embodiment of the present disclosure, as illustrated in FIG. 1 to FIG. 7, the fire grate comprises a fire grate body 100 and a flame stabilizer 200. The fire grate body 100 has a main gas channel 110 formed therein. A main gas outlet 120 is formed at a top of the fire grate body 100 and in communication with the main gas channel 110, and a communication opening 130 is formed at a side of the fire grate body 100 and in communication with the main gas channel 110. The flame stabilizer 200 is disposed outside the fire grate body 100 and forms an auxiliary gas channel 201 together with the fire grate body 100. The auxiliary gas channel 201 is in communication with the communication opening 130. The flame stabilizer 200 has an auxiliary gas outlet 202 formed at a top of the flame stabilizer 200 and in communication with the auxiliary gas channel 201.

[0035] The inventor found that a core component of a gas water heater is a fire grate provided in a burner. However, in the related art, the fire grate has high combustion intensity at fire hole, and accordingly performance of flue gas emitted during instantaneous combustion is poor, leading to high levels of nitrogen oxides. In the technical solution of the present disclosure, the flame stabilizer 200 is additionally provided at an outer side of the fire grate body 100, to increase the auxiliary gas channel 201 at the outer side of the fire grate body 100. The auxiliary gas channel 201 is in communication with the main gas channel 110 through the communication opening 130 at the side of the fire grate body 100. The main gas outlet 120 of the main gas channel 110 and the auxiliary gas outlet 202 of the auxiliary gas channel 201 together form a fire hole of the fire grate. After a gas flow is conveyed to the main gas channel 110, part of the gas flow enters the auxiliary gas channel 201 through the communication opening 130. The gas flow is shunted through the auxiliary gas channel 201, to reduce a gas outlet amount of the main gas outlet 120, which reduces a combustion intensity of a main gas opening. The auxiliary gas outlet 202 of the auxiliary gas channel 201 is equivalent to increasing a fire hole area of the fire grate. In this way, the combustion intensity of the fire grate is lowered, which is beneficial to ensuring a sufficient degree of the gas flow in the fire hole. Therefore, smoke performance of instantaneous combustion emission can be improved, and nitrogen oxides generated by combustion are reduced.

[0036] Further, in the embodiment, the flame stabilizer 200 comprises two first connectors 210 arranged opposite to each other and connected to the fire grate body 100. The communication opening 130 is formed on each of two opposite sides of the fire grate body 100. One of the two sides of the fire grate body 100 corresponding to one of the two first connectors 210 forms the auxiliary gas channel 201, and the auxiliary gas outlet 201 is formed at a top of the first connector 210 and in communication with the corresponding auxiliary gas channel 201. In this way, a gas outlet amount of the main gas outlet 120 and a fire hole area of the fire grate can be further reduced, to further lower the combustion intensity of the fire grate, which is beneficial to ensuring that the gas flow is fully combusted in the fire hole. Therefore, the smoke performance of instantaneous combustion emission is further improved, and the nitrogen oxides generated during combustion are

reduced.

[0037] Further, in the embodiment, the fire grate body 100 has a plurality of communication openings 130 formed at the side of the fire grate body 100. The plurality of communication openings 130 is arranged at intervals in a longitudinal direction of the fire grate body 100. The auxiliary gas channel 201 correspondingly extends in the longitudinal direction of the fire grate body 100. In this way, a flow area of the communication opening 130 is increased, which can improve circulation efficiency of the gas flow from the main gas channel 110 to the auxiliary gas channel 201, and facilitates an improvement in a shunting effect of the auxiliary gas channel 201 on the gas flow. Moreover, the plurality of communication openings 130 is arranged at intervals, allowing for a dispersed inflow of the gas flow to the auxiliary gas channel 201 from the main gas channel 110. In this way, a gas-out speed of the main gas outlet 120 and a gas-out speed of the auxiliary gas outlet 202 can be slowed down, and sufficient combustion of the gas flow is facilitated. In other embodiments of the present disclosure, it may also be that the communication opening 130 is constructed as an elongated shape extending in the longitudinal direction of the fire grate body 100.

[0038] In an embodiment, as illustrated in FIG. 1 to FIG. 4, a rectification rack 230 is provided at a top of each of the first connectors 210. It can be understood that in a combustion chamber of the burner, there is a plurality of fire grates arrayed in a transverse direction of the fire grate, and a gas flow of secondary air inlet flows out from a side of the fire grate in the transverse direction of the fire grate. Two rectification racks 230 are distributed at two opposite sides of the fire hole in the transverse direction of the fire grate. When the gas flow flows through the side of the fire grate in the transverse direction of the fire grate, the gas flow flows out of a tooth groove of the rectification rack 230, which allows a flow rate of the gas flow to be reduced, avoiding vortex generation. Therefore, the fire grate of the present disclosure can rectify the gas flow at the side of the fire grate through the rectification rack 230 disposed on the fire grate to ensure operation performance of the burner. Moreover, the rectification rack 230 is disposed at an outer side of the flame stabilizer 200 without affecting gas-out of the auxiliary gas outlet 202.

[0039] Further, in this embodiment, the flame stabilizer 200 further comprises a plurality of second connectors 220 arranged at intervals in the longitudinal direction of the fire grate body 100. Two ends of each of the plurality of second connectors 220 is connected to the tops of the two first connectors 210, respectively. The flame stabilizer 200 is sleeved on the fire grate body 100. The plurality of second connectors 220 is connected to the top of the fire grate body 100 and avoids the main gas outlet 120. The top of the first connector 210 is spaced apart from the corresponding side of the fire grate body 100. A bottom of the first connector 210 abuts against the side of the fire grate body 100. A top of the first connector 210 is spaced apart from the fire grate body 100 and is connected to the top of the fire grate body 100 through the second connector 220. Moreover, the second connector 220 avoids the main gas outlet 120. In this way, a connection stability of the flame stabilizer 200 and the fire grate body 100 is ensured, while a combustion area of the main gas outlet 120 is also ensured. In other embodiments of the present disclosure, it may also be that the two second connectors 220 are independently connected to two sides of the fire grate body 100 through a plurality of fixed-connection protruding portions 211 arranged at intervals in a longitudinal direction of the two second connectors 220, to construct two auxiliary gas channels 201.

[0040] Further, in the embodiment, as illustrated in FIG. 1, the rectification rack 230 comprises a plurality of tooth sections arranged at intervals. A fixation member 231 is provided between two adjacent ones of the plurality of tooth sections and is used for being connected by the second connector 220. It can be understood that the fixation member 231 is a flat groove structure located between two adjacent tooth sections, and the second connector 220 is connected to the fixation member 231, i.e., a fixed connection of the fixation member 231 with the first connector 210 is realized. The arrangement of the fixation member 231 can improve connection stability of the first connector 210 and the second connector 220, to ensure the structural stability of the flame stabilizer 200. In other embodiments of the present disclosure, it may also be that the rectifier rack 230 is constructed as a continuous structure.

[0041] Further, in this embodiment, as illustrated in FIG. 5 to FIG. 7, the main gas outlet 120 comprises a plurality of first fire holes 121 arranged at intervals in the longitudinal direction of the fire grate body 100. A partition 140 is disposed between two adjacent ones of the plurality of first fire holes 121. One of the plurality of second connectors 220 is correspondingly connected to one partition 140. In this way, under the separation of the partition 140, a plurality of fire holes is formed at the top of the fire grate body 100, which plays a shunting role in the gas-out of the gas flow, and is beneficial to improving distribution uniformity of flame at the main gas outlet, to further ensure that the gas flow is fully combusted in the fire hole. Therefore, the smoke performance of instantaneous combustion emission is further improved, and the nitrogen oxide generated by combustion is reduced. Further, the plurality of partitions 140 is uniformly arranged at intervals at the top of the fire grate body 100, which can further improve the distribution uniformity of the flame at the main gas outlet. In addition, the second connectors 220 are connected to the partition 140, which can prevent the second connector 220 from interfering with the gas-out of the main gas outlet 120. Therefore, sufficient combustion of the gas flow is ensured.

[0042] Further, in the embodiment, the main gas outlet 120 further comprises a plurality of second fire holes 122 formed in the partition 140. The plurality of second fire holes 122 is arranged in a rectangular array or arranged at intervals in the transverse direction of the fire grate. By providing the plurality of partitions 140, the plurality of first fire holes 121 is formed to preliminarily shunt the gas-out of the gas flow. Moreover, the plurality of second fire holes 122 is provided at a spacing

portion, and at least two second fire holes 122 are arranged at intervals in a transverse direction of the fire grate body 100 to implement secondary shunting of the gas flow. In this way, an area of the first fire hole 121 may be set to be great to reduce an arrangement number of the first fire holes 121. Meanwhile, the arrangement of the plurality of second fire holes 122 can further improve the uniformity of the flame.

[0043] Further, in the embodiment, as illustrated in FIG. 2 to FIG. 7, the fire grate further comprises a combustion panel 300. The combustion panel 300 is constructed as a metal net structure and is fixedly connected to the partition 140. The combustion panel 300 of the metal net structure can improve a heat load of the fire grate, making an adaptability range of the fire grate be improved. Further, gas exhaust performance of the instantaneous combustion is better, and finally, it is realized that the nitrogen oxide generated after combustion is lower. Meanwhile, considering that a temperature at a burning position during fuel combustion is high, in order to ensure a service life of the combustion panel 300, a multi-layer metal net needs to be a high-temperature-resistant material. In other embodiments of the present disclosure, it may also be that the combustion panel 300 is not provided, and the gas flow is directly combusted at the first fire hole 121 and the second fire hole 122 of the fire grate body 100.

[0044] Further, as illustrated in FIG. 2 to FIG. 4, the combustion panel 300 is constructed as a multi-layer metal net structure. When an opening area of the metal net is great, the multi-layer metal net structure can prevent accidents such as a burner explosion caused by tempering. Multiple layers of the metal net are set to be related to a mesh number of the multi-layer metal net. Multiple layers of nets in the multi-layer metal net are negatively correlated with the mesh number of nets, i.e., a metal net with a great mesh number has a small corresponding number of layers, and a metal net with a small mesh number has a great corresponding number of layers. For example, the number of layers of the multi-layer metal net comprises but is not limited to a range from 2 layers to 10 layers, and specifically may be 2 layers, 3 layers, 5 layers, 8 layers, or 10 layers. The number of commonly used metal nets ranges from 20 mesh to 100 mesh, which may specifically be 20 mesh, 40 mesh, 50 mesh, 60 mesh, 80 mesh, or 100 mesh. Considering that an excessive number of layers may result in insufficient supply of gas flow and that metal nets with larger meshes are expensive, through test and research, a preferred combination of the multi-layer metal nets is 50 meshes and 3 layers. Since the combustion panel 300 is of a multi-layer metal net structure, an area of the main gas outlet 120 is increased, which allows the smoke emission performance during instantaneous combustion to be better and can lower the generation of nitrogen oxides. Meanwhile, the combustion panel 300 further has a flame stabilizing effect, which can improve an increase in a heat load combustion adaptation range of the fire grate body 100 and solve a use problem where a small load cannot be made low, allowing the fire grate body 100 to reduce segmentation, have a simple structure, to be convenient in manufacturing, and to have a low cost. Moreover, use requirements of low-nitrogen emission of the whole machine can be met.

[0045] In an embodiment, as illustrated in FIG. 2 and FIG. 4, the combustion panel 300 is a multi-layer metal net structure which is integrally formed and bended into multiple layers. During production and processing of the combustion panel 300, a one-chip metal net can be bent multiple times to form the combustion panel 300 of the multi-layer metal net structure. In this way, processing and molding of the combustion panel 300 can be facilitated, to improve production efficiency of the combustion panel 300.

[0046] In an embodiment, as illustrated in FIG. 3, the combustion panel 300 comprises a plurality of laminated layers of metal nets, and a buffer cavity 310 is formed between two adjacent ones of the plurality of laminated layers of metal nets. In an exemplary embodiment of the present disclosure, in two adjacent layers of metal nets, edges of two opposite ends of at least one layer of metal net are bent to form a bent portion, at which a tension is generated, and a strength of the bent metal net is higher. Folded edges may be two sides in the transverse direction or in the longitudinal direction. Considered from the perspective of the effect, a bending tension at two ends of the metal net in a longitudinal direction of the metal net is larger, and a strength of the corresponding metal net is also larger. Secondly, the bent portion is connected to a bent portion or a metal net in another layer, enabling the buffer cavity 310 to be formed between the metal nets in two adjacent layers. In this way, the effect of slowing down gas flow deceleration can be achieved, to ensure that the main gas outlet 120 has sufficient gas flow supply.

[0047] In an embodiment, as illustrated in FIG. 2 and FIG. 3, the combustion panel 300 is disposed at a side of the partition 140 facing away from the second connector 220. In this way, after the combustion panel 300 is connected to the partition 140, the partition 140 can support the combustion panel 300 to prevent the combustion panel 300 from softening and collapsing downwards, which is beneficial to ensuring operation performance of the fire grate. In an exemplary embodiment of the present disclosure, each of the combustion panel 300 and the second connector 220 is respectively connected to two opposite sides of the partition 140 by welding, enabling both the combustion panel 300 and the flame stabilizer 200 to be stably fixed at the fire grate body 100. Further, the partition 140 is provided with a welding engagement section 150 protruding outwards from the second connector 220, to provide a welding point to facilitate performing a welding operation on the partition 140 and the second connector 220 or the combustion panel 300. Without loss of generality, in this embodiment, during the production of the fire grate, the top of the fire grate body 100 may be bent first to facilitate the placement of the combustion panel 300. Then, a welding operation is performed on the combustion panel 300 and the fire grate body 100, allowing the combustion panel 300 and the plurality of partitions 140 to be point-welded and connected to each other at positions of a plurality of welding engagement sections 150. Then, three sides of the fire grate

body 100 are snap-fitted and riveted to each other. Finally, the flame stabilizer 200 is sleeved on the outer side of the fire grate body 100, and the fire grate body 100 is welded to the combustion panel 300. Similarly, the second connectors 220 are spot-welded and connected to the partition 140 at the welding engagement section 150, and a bottom of the first connector 210 is spot-welded and connected to the side of the fire grate body 100.

[0048] In an embodiment, as illustrated in FIG. 4, the combustion panel 300 is disposed between the partition 140 and the second connector 220, and the second connectors 220 are connected to the partition 140 through the combustion panel 300. In this way, each of the second connector 220 and the partition 140 plays a support role in the combustion panel 300 to prevent the combustion panel 300 from softening and collapsing downwards, which is beneficial to ensuring the operation performance of the fire grate. The combustion panel 300 is welded to at least one of the second connector 220 or the partition 140. After a bottom of the flame stabilizer 200 is welded and fixed to the side of the fire grate body 100, each of the combustion panel 300 and the flame stabilizer 200 can be reliably and fixedly connected to the fire grate body 100. Without loss of generality, in this embodiment, the production process of the fire grate may comprise: welding and fixing the combustion panel 300 and the plurality of partitions 140 at the top of the fire grate body 100, or welding and fixing an inner side of the flame stabilizer 200 and the plurality of second connectors 220, and fastening and riveting the three sides of the fire grate body 100, then sleeving the flame stabilizer 200 on the outer side of the fire grate body 100, and finally welding the bottom of the first connector 210 of the flame stabilizer 200 with the side of the fire grate body 100. When the combustion panel 300 is welded to the inner side of the flame stabilizer 200, a connection between the first connector 210 and the second connector 220 of the flame stabilizer 200 may be bent first, allowing the two first connectors 210 to be flared out relative to the second connector 220, and the combustion panel 300 is then placed in the flame stabilizer 200, and the combustion panel 300 and the second connector 220 are spot-welded.

[0049] In an embodiment, as illustrated in FIG. 7, the side of the main gas outlet 120 is provided with a blocking protrusion 160 protruding in the transverse direction or the longitudinal direction of the fire grate. Without loss of generality, each of the side of the first fire hole 121 or the side of the second fire hole 122 is convexly provided with a blocking protrusion 160 inwards, and the blocking protrusion 160 can play a role in shielding the flame, enabling the flame to be correspondingly concentrated in a middle region of the first fire hole 121 or the second fire hole 122. In this way, a gas flow flowing out of the gas outlet is allowed to be combusted intensively, which facilitates the sufficient combustion of the gas flow, improving the smoke performance of instantaneous combustion emission and lowering the nitrogen oxide generated by combustion. The welding portion 150 protrudes from the side of the partition 140 in the longitudinal direction of the fire grate, and can also play a predetermined role in shielding the flame. In order to distinguish the blocking protrusion 160 from the welding engagement section 150 to prevent the welding engagement section 150 from being confused with the blocking protrusion 160 protruding in the longitudinal direction for realizing fool-proof of the welding operation, a top end of the blocking protrusion 160 may be constructed as a pointed structure, and the welding engagement section 150 is constructed as an arc-shaped structure. In other embodiments of the present disclosure, it may also be that the same protrusion is used as the blocking protrusion 160 and the welding engagement section 150 concurrently.

[0050] Without loss of generality, each of the flame stabilizer 200 and the fire grate body 100 is integrally formed into a sheet shape in a sheet metal stamping manner. For the fire grate body 100, structures such as the communication opening 130, the partition 140, and the blocking protrusion 160 are integrally formed on the fire grate body 100 during stamping, and then bent and docked to construct the main gas channel 110. For the flame stabilizer 200, the rectification rack 230, the first connector 210, and the second connector 220 are each integrally formed during stamping, and then need to be bent and then sleeved on the outer side of the fire grate body 100.

[0051] The present disclosure further provides a burner. The burner comprises a plurality of fire grates. A specific structure of the fire grate refers to the above embodiments. Since the burner adopts all the technical solutions of all the above embodiments, all beneficial effects brought by the technical solutions of the above embodiments are at least provided, and details are omitted herein. The burner has a combustion chamber. The plurality of fire grates is arranged at intervals in the combustion chamber in a transverse direction of the plurality of fire grates.

[0052] The present disclosure further provides a gas water heater. The gas water heater comprises a burner. For a specific structure of the burner, reference can be made to the above embodiments. Since the burner adopts all the technical solutions of all the above embodiments, all beneficial effects brought by the technical solutions of the above embodiments are at least provided, and details are omitted herein.

[0053] The embodiments as described above are merely optional embodiments of the present disclosure, and are not therefore intended to limit the scope of the present disclosure. Any equivalent structural modification made based on the specification and the accompanying drawings of the present disclosure, or directly/indirectly application to other related art, are all comprised within the scope of the present disclosure under the inventive concept of the present disclosure.

Claims

1. A fire grate comprising:

a fire grate body having a main gas channel formed therein, a main gas outlet formed at a top of the fire grate body and being in communication with the main gas channel, and a communication opening formed at a side of the fire grate body and being in communication with the main gas channel; and
a flame stabilizer disposed outside the fire grate body and forming an auxiliary gas channel together with the fire grate body, the auxiliary gas channel being in communication with the communication opening, wherein an auxiliary gas outlet is formed at a top of the flame stabilizer and communicates with the auxiliary gas channel.

2. The fire grate according to claim 1, wherein:

the flame stabilizer comprises two first connectors arranged opposite to each other and connected to the fire grate body;
the communication opening is formed on each of two opposite sides of the fire grate body; and
one of the two first connectors forms the auxiliary gas channel with its corresponding side of the fire grate body, and the auxiliary gas outlet is formed at a top of the first connector and communicates with the corresponding auxiliary gas channel.

3. The fire grate according to claim 2, wherein:

the flame stabilizer further comprises a plurality of second connectors arranged at an interval in a longitudinal direction of the fire grate body, two ends of the plurality of second connectors being connected respectively to the tops of the two first connectors;
the flame stabilizer is sleeved on the fire grate body;
the plurality of second connectors is connected to the top of the fire grate body and arranged to avoid interference with the main gas outlet; and
the top of the first connector is spaced apart from the corresponding side of the fire grate body.

4. The fire grate according to claim 3, wherein:

the main gas outlet comprises a plurality of first fire holes arranged at an interval in the longitudinal direction of the fire grate body;
a partition is disposed between two adjacent ones of the plurality of first fire holes; and
one of the plurality of second connectors is correspondingly connected to the partition.

5. The fire grate according to claim 4, wherein the main gas outlet further comprises a plurality of second fire holes formed in the partition, the plurality of second fire holes being arranged in a rectangular array or arranged at an interval in a transverse direction of the fire grate.

6. The fire grate according to claim 4 or 5, further comprising a combustion panel configured as a metal net structure and fixedly connected to the partition.

7. The fire grate according to claim 6, wherein:

the combustion panel is disposed at a side of the partition facing away from the second connectors; or the combustion panel is disposed between the partition and the second connectors, and the second connectors are connected to the partition through the combustion panel; and/or
the combustion panel is an integrally formed and bent multi-layer metal net structure; or the combustion panel comprises multiple layers of metal nets arranged in a laminated structure, and a buffer cavity is formed between two adjacent layers of metal nets.

8. The fire grate according to any one of claims 1 to 7, wherein:

the fire grate body has a plurality of communication openings formed at the side of the fire grate body, the plurality of communication openings being arranged at an interval in the longitudinal direction of the fire grate body; and
the auxiliary gas channel correspondingly extends in the longitudinal direction of the fire grate body.

9. A burner, comprising a fire grate according to any one of claims 1 to 8.

10. A gas water heater, comprising a burner according to claim 9.

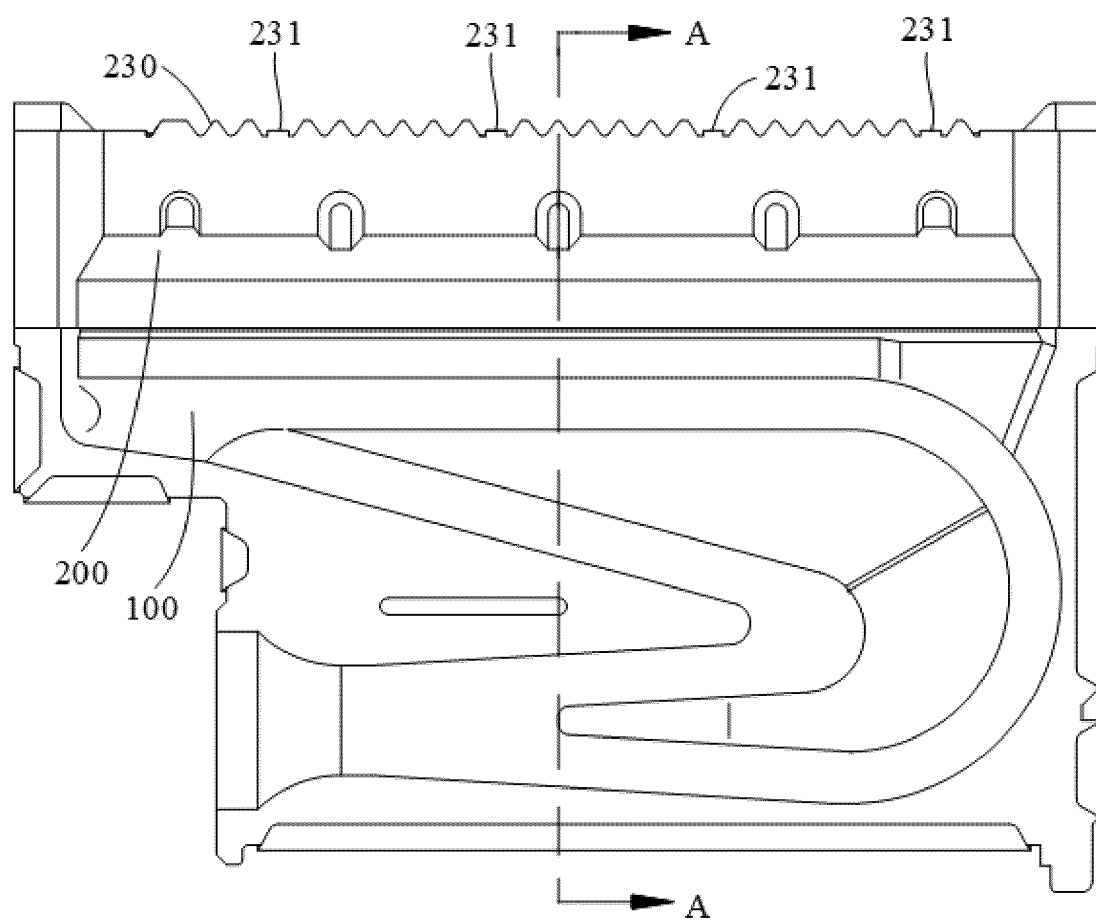


FIG. 1

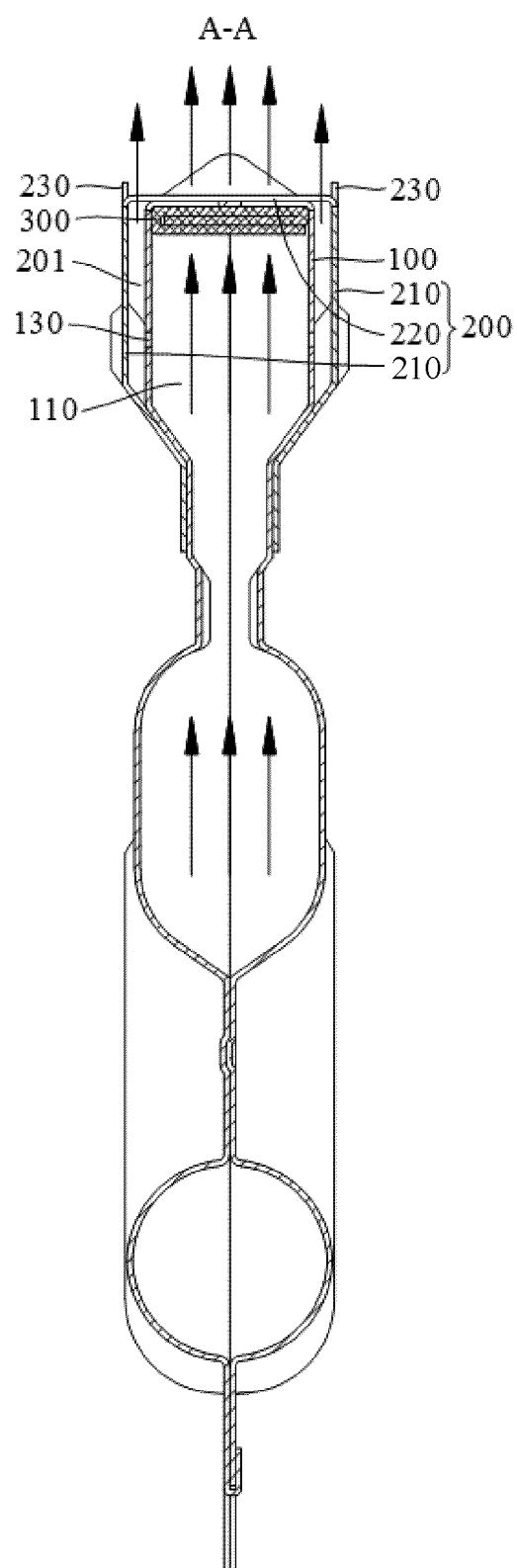


FIG. 2

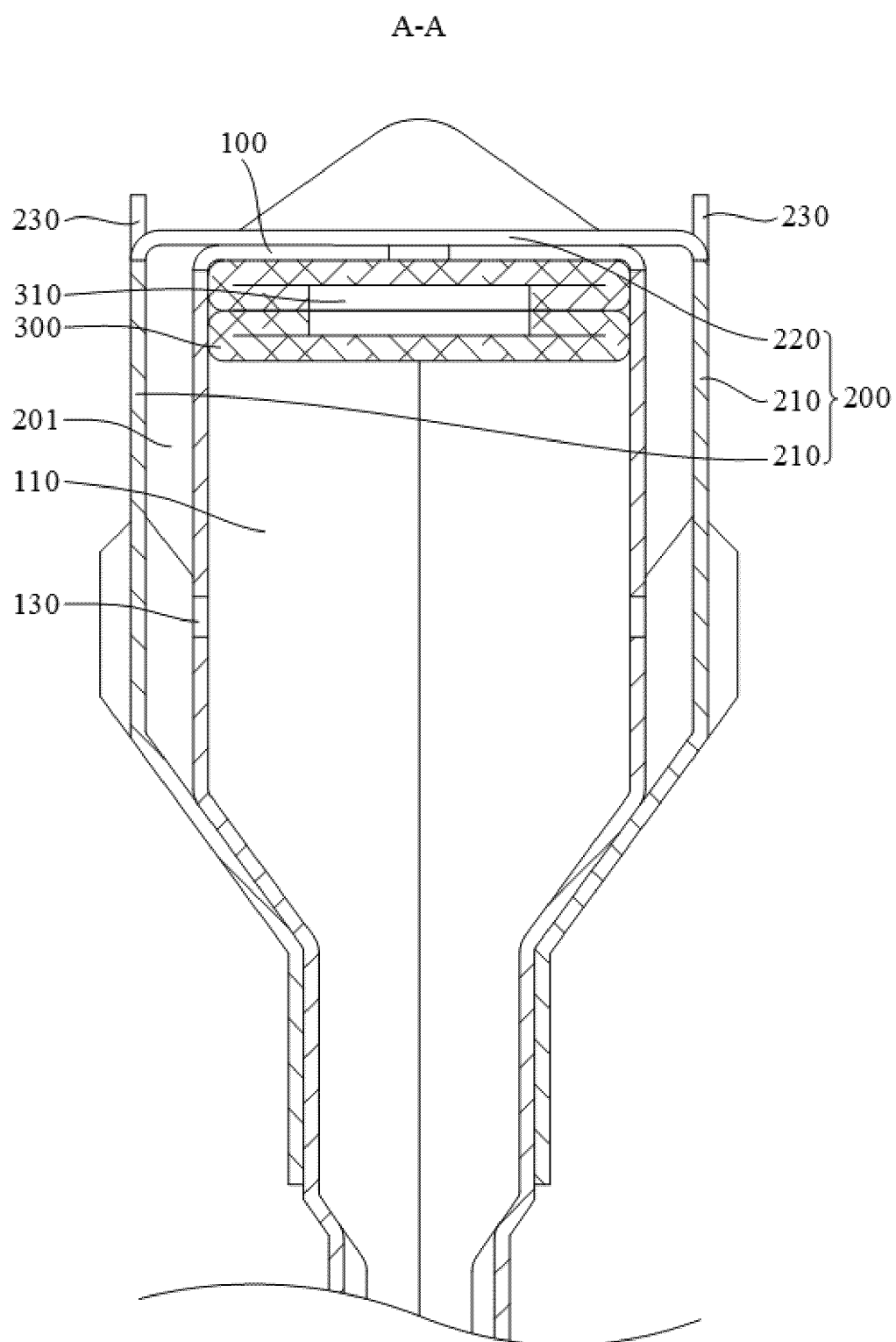


FIG. 3

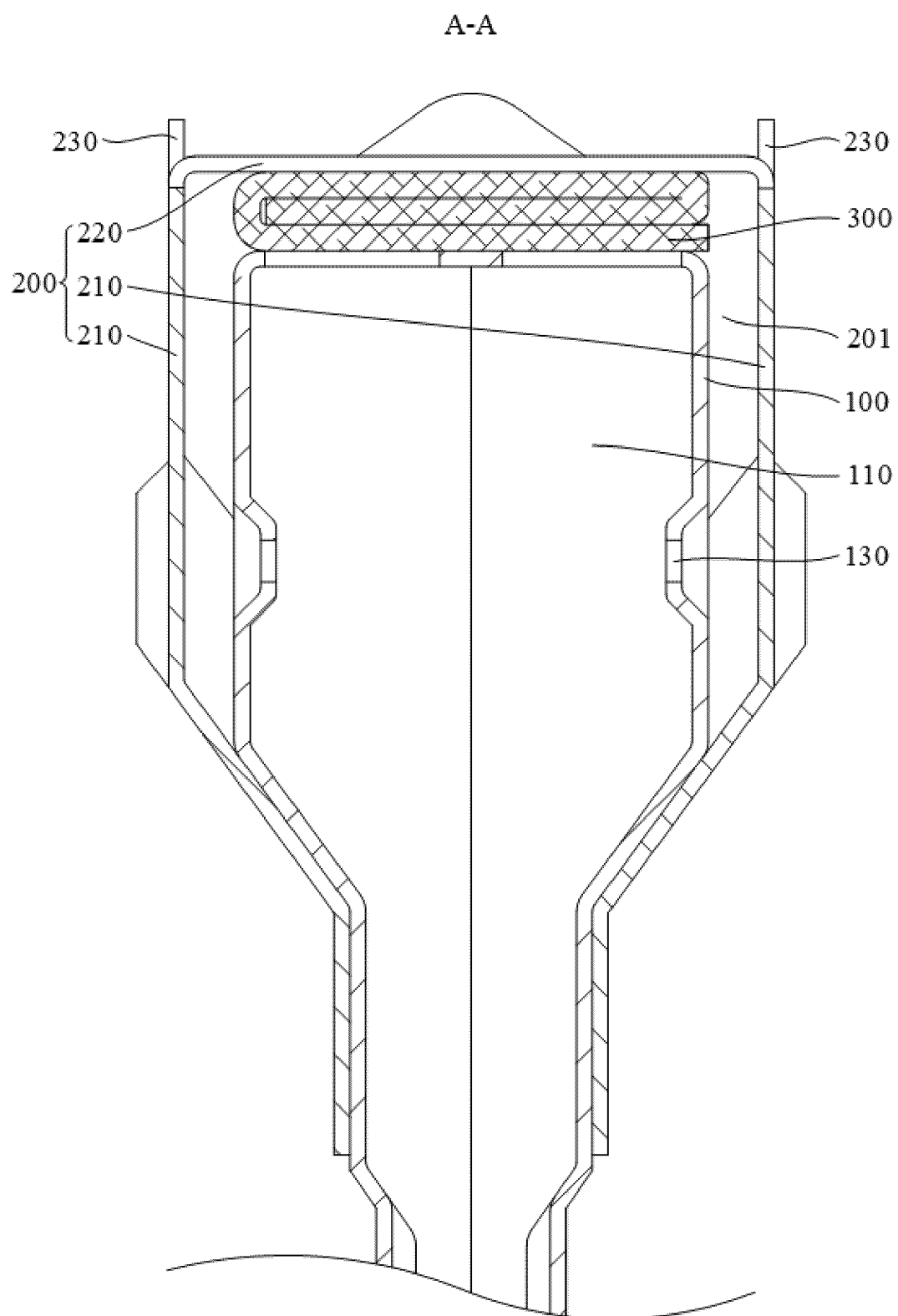


FIG. 4

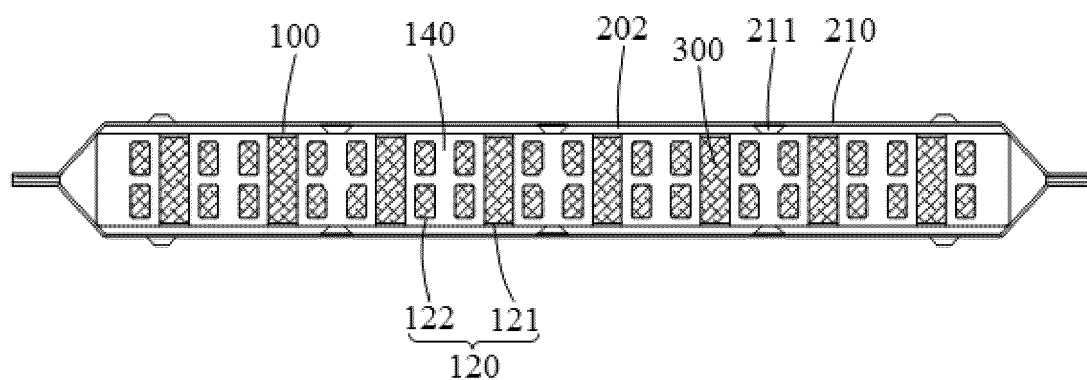


FIG. 5

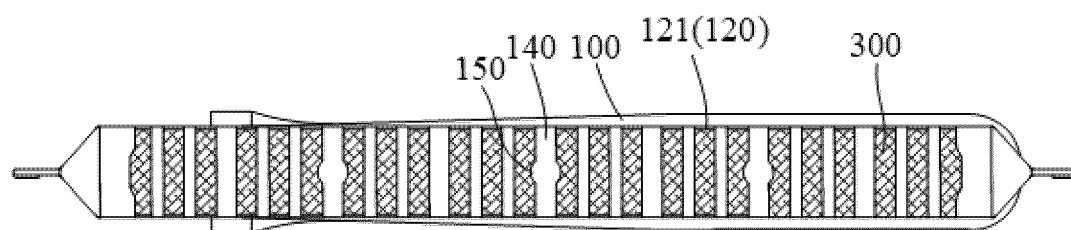


FIG. 6

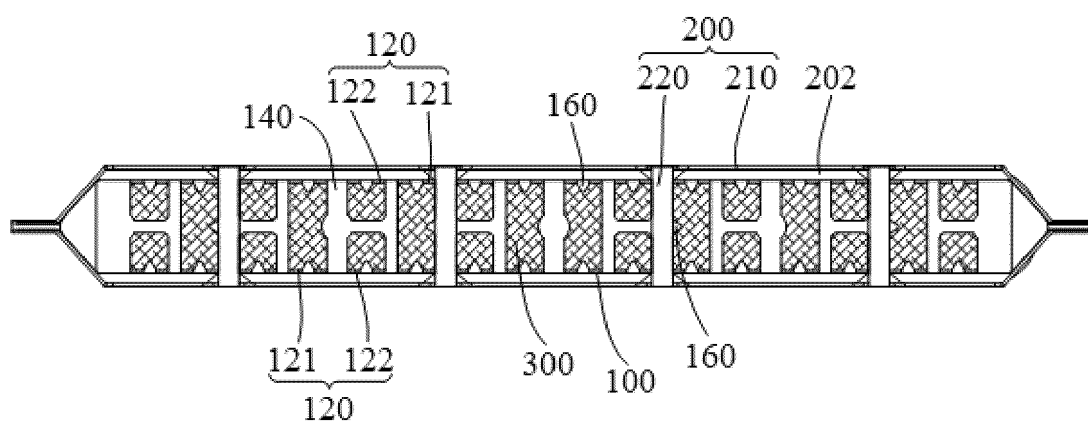


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

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5	A. CLASSIFICATION OF SUBJECT MATTER		
	F23D14/02(2006.01)i; F23D14/26(2006.01)i; F23D14/62(2006.01)i; F23D14/58(2006.01)i		
	According to International Patent Classification (IPC) or to both national classification and IPC		
10	B. FIELDS SEARCHED		
	Minimum documentation searched (classification system followed by classification symbols)		
	IPC: F23D, F24H		
	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
	CNABS, CNTXT, WPABSC, VEN, CNKI: 燃烧器, 火排, 稳焰, 套设, 火孔, 金属网, burner, combustor, fire, grate, row, hole, net, mesh, sleeve, flame		
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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25	PX	CN 115127104 A (WUHU MIDEA KITCHEN & BATH APPLIANCES MANUFACTURING CO., LTD. et al.) 30 September 2022 (2022-09-30) description, paragraphs [0005]-[0123], and figures 1-29	1-10
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30	X	CN 106322380 A (TIANJIN UNIVERSITY) 11 January 2017 (2017-01-11) description, paragraphs [0005]-[0026], and figures 1-5	1-5, 8-10
	Y	CN 106322380 A (TIANJIN UNIVERSITY) 11 January 2017 (2017-01-11) description, paragraphs [0005]-[0026], and figures 1-5	6-7
35	Y	CN 217302792 U (WUHU MIDEA KITCHEN & BATH APPLIANCES MANUFACTURING CO., LTD. et al.) 26 August 2022 (2022-08-26) description, paragraphs [0003]-[0085], and figures 1-30	6-7
40	☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "D" document cited by the applicant in the international application "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
50	Date of the actual completion of the international search		Date of mailing of the international search report
	08 September 2023		13 September 2023
55	Name and mailing address of the ISA/CN		Authorized officer
	China National Intellectual Property Administration (ISA/CN) China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088		Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/099044

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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				WO	2022199700	A1	29 September 2022
				WO	2023151159	A1	17 August 2023
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CN	106322380	A	11 January 2017	None			
CN	217302792	U	26 August 2022	None			
CN	112856420	A	28 May 2021	None			
CN	214468614	U	22 October 2021	None			
CN	114440213	A	06 May 2022	None			
JP	H08200633	A	06 August 1996	None			
CN	112880199	A	01 June 2021	None			

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REFERENCES CITED IN THE DESCRIPTION

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