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(71) Applicants:
- **Qingdao Haier Washing Machine Co., Ltd.**
  Qingdao, Shandong 266101 (CN)
- **Haier Smart Home Co., Ltd.**
  Qingdao, Shandong 266101 (CN)

(72) Inventors:
- **MI, Delong**
  Qingdao, Shandong 266101 (CN)
- **BING, Jindong**
  Qingdao, Shandong 266101 (CN)
- **ZHENG, Xiaoqiu**
  Qingdao, Shandong 266101 (CN)
- **YANG, Kun**
  Qingdao, Shandong 266101 (CN)
- **SU, Min**
  Qingdao, Shandong 266101 (CN)

(74) Representative: **Ipside**
7-9 Allée Haussmann
33300 Bordeaux Cedex (FR)

(54) **GAS HEATING APPARATUS AND GAS CLOTHES DRYER**

(57) A gas-fired heating device and a gas-fired clothes dryer aiming to solve the problem that a gas-fired clothes dryer has low combustion efficiency of the gas. The gas-fired clothes dryer includes the gas-fired heating device and the gas-fired heating device includes a burner (100) and an igniter (200), where the burner (100) includes a body and a gas collecting plate, the gas collecting plate is concave upwards to form a gas collecting chamber (113), and the body has a combustion end provided with a nozzle (101); the gas collecting plate is connected with the combustion end, and the gas collecting plate is located above the nozzle (101), so that gas ejected from the nozzle (101) enters the gas collecting chamber (113); the igniter (200) is provided with an ignition end (201) located outside the nozzle (101), and the ignition end (201) extends into the gas collecting chamber (113). By the above arrangement, the gas ejected from the nozzle (101) is firstly gathered in the gas collecting chamber (113), and the gas collecting chamber (113) can prevent the gas ejected from the nozzle (101) from escaping to reduce the escaping amount of the gas, so that the gas ejected from the nozzle (101) can be ignited by the igniter (200) as much as possible, thereby improving the combustion efficiency of the gas.

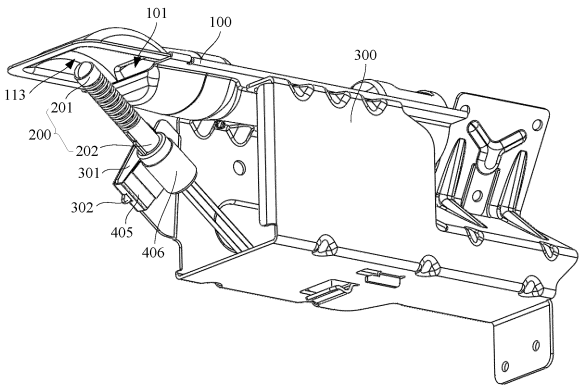

FIG. 3

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Description

[0001] This application claims priority to Chinese Patent Application No. 202210181871.2, entitled "GAS-FIRED HEATING DEVICE AND GAS-FIRED CLOTHES DRYER", and filed with the China National Intellectual Property Administration on February 25, 2022, which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] Embodiments of the present application belong to the technical field of clothes dryers and, in particular, to a gas-fired heating device and a gas-fired clothes dryer.

BACKGROUND

[0003] Gas-fired clothes dryer uses the heat generated by gas combustion to heat air, and the heated dry hot air enters a clothes drying drum and contacts with wet clothes in the clothes drying drum, thereby drying the clothes.

[0004] In the related art, a gas-fired clothes dryer includes a housing, a clothes drying drum, a blower fan and a gas-fired heating device. The housing is internally provided with an accommodating space, and the clothes drying drum, the blower fan and the gas-fired heating device are all disposed in the accommodating space. The gas-fired heating device includes a burner, a combustion cylinder and an igniter. The igniter is disposed close to the burner. A spray head of the burner is hemispherical, and an axis of the hemispherical spray head is parallel to a horizontal plane. A plurality of nozzles are provided on the surface of the hemispherical spray head, and each of the nozzles faces a different direction. The spray head and the igniter are both accommodated in the combustion cylinder. The gas ejected from the spray head is ignited by the igniter, the heat generated by gas combustion heats the air in the combustion cylinder, and the heated air enters the clothes drying drum under the action of the blower fan to dry the clothes in the clothes drying drum.

[0005] However, the gas ejected from the nozzles away from the igniter is difficult to be ignited, resulting in a decrease in the combustion efficiency of the gas.

SUMMARY

[0006] The main purpose of embodiments of the present application is to provide a gas-fired heating device and a gas-fired clothes dryer to solve the problem that a related gas-fired clothes dryer has low combustion efficiency of the gas.

[0007] In order to achieve the above purpose, embodiments of the present application provide a gas-fired heating device, including a burner and an igniter, where the burner includes a body and a gas collecting plate, the gas collecting plate is concave upwards to form a gas collecting chamber, and the body has a combustion end provided with a nozzle; the gas collecting plate is connected with the combustion end, and the gas collecting plate is located above the nozzle, so that gas ejected from the nozzle enters the gas collecting chamber; the igniter is provided with an ignition end located outside the nozzle, and the ignition end extends into the gas collecting chamber.

[0008] In a preferred technical solution of the above gas-fired heating device, the body includes a first connecting plate and a second connecting plate, the first connecting plate is attached to the second connecting plate, the first connecting plate is provided with a first groove, and the first groove is concave away from the second connecting plate; the second connecting plate is provided with a second groove, the second groove is concave away from the first connecting plate, the second groove is right opposite to the first groove, and a gas channel is formed by being enclosed by the second groove and the first groove; the nozzle is formed at one end of the gas channel close to the gas collecting chamber, an inlet port is formed at one end of the gas channel away from the gas collecting chamber, and the gas channel is connected with the gas collecting chamber through the nozzle.

[0009] In a preferred technical solution of the above gas-fired heating device, the first groove is provided with a first flow guide groove wall, the first flow guide groove wall is close to the gas collecting chamber, the first flow guide groove wall is disposed inclined relative to the first connecting plate, and a distance between the first flow guide groove wall and the inlet port increases from a groove bottom of the first groove to a groove opening of the first groove.

[0010] In a preferred technical solution of the above gas-fired heating device, the second groove is provided with a second flow guide groove wall, the second flow guide groove wall is close to the gas collecting chamber, the second flow guide groove wall is disposed inclined relative to the second connecting plate, and a distance between the second flow guide groove wall and the inlet port increases from a groove bottom of the second groove to a groove opening of the second groove.

[0011] In a preferred technical solution of the above gas-fired heating device, the gas collecting chamber includes a first side wall, a second side wall and a flow guide wall, the first side wall is perpendicular to the first connecting plate, and the first side wall is parallel to an axis of the gas channel; the second side wall and the first side wall are parallel and spaced apart from each other, and the first side wall and the second side wall are connected through the flow guide wall; the gas

collecting chamber is formed by being enclosed by the first side wall, the second side wall and the flow guide wall, and one end of the flow guide wall close to the nozzle is connected with one end of the first flow guide groove wall close to the second connecting plate.

[0012] In a preferred technical solution of the above gas-fired heating device, a projection of the flow guide wall on a plane where the first side wall is located is in a circular arc shape.

[0013] In a preferred technical solution of the above gas-fired heating device, an angle between an axis of the igniter and a plane where the first connecting plate is located is an acute angle; the igniter further has a fixing end, and the fixing end is closer to the inlet port than the ignition end.

[0014] In a preferred technical solution of the above gas-fired heating device, the second connecting plate is bent upward along two ends of an axis perpendicular to the gas channel to form bent plates, slots are formed by being enclosed by the bent plates and the second connecting plate, and the first connecting plate is embedded into the slots.

[0015] In a preferred technical solution of the above gas-fired heating device, the gas-fired heating device further includes a mounting bracket, and the burner and the igniter are both connected to the mounting bracket.

[0016] Embodiments of the present application further provide a gas-fired clothes dryer, including the above gas-fired heating device.

[0017] Those skilled in the art can understand that the gas-fired clothes dryer according to the embodiments of the present application includes the gas-fired heating device and the gas-fired heating device includes the burner and the igniter, where the burner includes the body and the gas collecting plate, the gas collecting plate is concave upwards to form the gas collecting chamber, and the body has the combustion end provided with the nozzle; the gas collecting plate is connected with the combustion end, and the gas collecting plate is located above the nozzle, so that gas ejected from the nozzle enters the gas collecting chamber; the igniter is provided with the ignition end located outside the nozzle, and the ignition end extends into the gas collecting chamber. By the above arrangement, the gas ejected from the nozzle is firstly gathered in the gas collecting chamber, and the gas collecting chamber can prevent the gas ejected from the nozzle from escaping to reduce the escaping amount of the gas, so that the gas ejected from the nozzle can be ignited by the igniter as much as possible, thereby improving the combustion efficiency of the gas.

BRIEF DESCRIPTION OF DRAWINGS

[0018] Preferred implementations of the gas-fired clothes dryer according to embodiments of the present application are described below with reference to the accompanying drawings. The accompanying drawings are:

FIG. 1 is a schematic structural diagram of a gas-fired heating device and a mounting bracket according to an embodiment of the present application.

FIG. 2 is a section view of a burner in a gas-fired heating device according to an embodiment of the present application.

FIG. 3 is a first schematic structural diagram of a gas-fired heating device according to an embodiment of the present application.

FIG. 4 is a schematic structural diagram of a first connecting plate in a gas-fired heating device according to an embodiment of the present application.

FIG. 5 is a schematic structural diagram of a second connecting plate in a gas-fired heating device according to an embodiment of the present application.

FIG. 6 is a second schematic structural diagram of a gas-fired heating device according to an embodiment of the present application.

FIG. 7 is a schematic structural diagram of a fixing bracket in a gas-fired heating device according to an embodiment of the present application.

FIG. 8 is a schematic structural diagram of a mounting bracket in a gas-fired heating device according to an embodiment of the present application.

FIG. 9 is a schematic structural diagram of a burner in a gas-fired heating device according to an embodiment of the present application.

FIG. 10 is a first schematic structural diagram of a burner suitable for liquefied gas in a gas-fired heating device according to an embodiment of the present application.

FIG. 11 is a second schematic structural diagram of a burner suitable for liquefied gas in a gas-fired heating device according to an embodiment of the present application.

FIG. 12 is a schematic structural diagram of a burner suitable for natural gas in a gas-fired heating device according to an embodiment of the present application.

[0019] In the accompanying drawings:

100:	burner	200:	igniter
300:	mounting bracket	400:	fixing bracket
500:	air inlet barrel	600:	gas valve
700:	inlet tube	701:	inlet valve
800:	combustion cylinder	101:	nozzle
102:	inlet port	110:	first connecting plate
111:	first groove	112:	first flow guide groove wall
113:	gas collecting chamber	114:	first side wall
115:	second side wall	116:	flow guide wall
117:	first connecting hole	120:	second connecting plate
121:	second groove	122:	second flow guide groove wall
123:	bent plate	124:	second connecting hole
125:	combustion-supporting air conditioner	126:	rotatable tube
127:	inlet plate	128:	inlet hole
129:	first adjusting opening	130:	first limit hole
131:	second limit hole	132:	second adjusting opening
133:	third limit hole	134:	third adjusting opening
201:	ignition end	202:	fixing end
301:	mounting plate	302:	insertion block
401:	first fixing plate	402:	third connecting hole
403:	second fixing plate	404:	fixing hole
405:	third fixing plate	406:	fixing ring
407:	fastening plate	501:	air inlet clearance
502:	fourth fixing plate	503:	first plate body
504:	second plate body	505:	third plate body

DESCRIPTION OF EMBODIMENTS

[0020] First of all, persons of ordinary skill in the art should understand that these embodiments are only used for explanation of the technical principle of embodiments of the present application, and are not intended to limit the protection scope of embodiments of the present application. Persons of ordinary skill may make adjustment as needed so as to adapt to specific application scenarios.

[0021] Secondly, it should be noted that in the description of embodiments of the present application, the terms for the direction or positional relationship indicated by the terms "inside" and "outside" and so on are based on the direction or positional relationship shown in the accompanying drawings, which is only for the convenience of description and not intended to indicate or imply that the device or component must be of a particular orientation, and be constructed and operate in a particular orientation, and therefore should not be understood as a limitation to embodiments of the present application.

[0022] In addition, it should also be noted that, in the description of embodiments of the present application, unless otherwise expressly specified and limited, the terms "connected/connecting" and "connection" should be understood in a broad sense. For example, "connection" may be a fixed connection, a detachable connection, or an integral connection; "connection" may be a mechanical connection or an electrical connection; "connection" may be a direct connection or an indirect connection through an intermediate medium; and "connection" may be the internal communication of two components. For persons of ordinary skill in the art, the specific meanings of the above terms in embodiments of the present application may be understood according to specific situations.

[0023] To make the objectives, technical solutions, and advantages of embodiments of the present application clearer, the technical solutions in embodiments of the present application will be described clearly and comprehensively below with reference to the accompanying drawings for embodiments of the present application. Apparently, the described embodiments are merely a part of embodiments rather than all embodiments of the present application. All other embodiments obtained by persons of ordinary skill in the art based on embodiments of the present application without creative effort shall fall within the protection scope of the present application.

[0024] A gas-fired clothes dryer in the related art includes a housing, a clothes drying drum, a blower fan and a gas-fired heating device. The housing is internally provided with an accommodating space, and the clothes drying drum, the blower

fan and the gas-fired heating device are all disposed in the accommodating space. The gas-fired heating device includes a gas valve, an inlet tube, a burner, a combustion cylinder and an igniter. The gas valve is provided with an inlet port and an outlet port, the inlet port is connected with the inlet tube, and the outlet port is connected with the burner. The burner is provided with a combustion-supporting air inlet port and a spray head, the combustion-supporting air inlet port is used for enabling the combustion-supporting air to enter the inside of the burner, and the combustion-supporting air is mixed with the gas in the burner and then the mixed gas is ejected out from the spray head. The igniter is disposed close to the burner. The spray head and the igniter are both accommodated in the combustion cylinder. The gas ejected from the spray head is ignited by the igniter, the heat generated by gas combustion heats the air in the combustion cylinder, and the heated air enters the clothes drying drum under the action of the blower fan to dry the clothes in the clothes drying drum.

[0025] The spray head of the burner is generally hemispherical, and an axis of the hemispherical spray head is parallel to a horizontal plane. A plurality of nozzles are provided on the surface of the hemispherical spray head, and each of the nozzles faces a different direction. The gas is ejected from the nozzles. The gas ejected from the nozzles close to the igniter is easy to be ignited, while the gas ejected from the nozzles away from the igniter is difficult to be ignited by the igniter due to the long distance from the igniter and is easy to directly escape into the combustion cylinder without combustion, so that the gas ejected from the nozzles is not fully combusted, resulting in a decrease in the combustion efficiency of the gas and a waste of gas energy.

[0026] Embodiments of the present application provide a gas-fired heating device and a gas-fired clothes dryer, where a gas collecting chamber is disposed outside a nozzle of a burner, and an ignition end of an igniter extends into the gas collecting chamber to ignite the gas in the gas collecting chamber. The gas ejected from the nozzle is gathered in the gas collecting chamber, and the gas collecting chamber can prevent the gas ejected from the nozzle from escaping to reduce the escaping amount of the gas, so that the gas ejected from the nozzle can be more fully combusted, thereby improving the combustion efficiency of the gas.

[0027] The principles and features of embodiments of the present application are described below with reference to the accompanying drawings, and the examples given are merely used for explaining embodiments of the present application, and are not used for limiting the scope of embodiments of the present application.

[0028] A gas-fired clothes dryer provided by an embodiment of the present application includes a housing, and a gas-fired heating device, a mounting bracket 300, a clothes drying drum and a blower fan which are disposed in the housing. The clothes drying drum is used for placement of clothes to be dried. The gas-fired heating device is detachably connected to the mounting bracket 300, and the mounting bracket 300 is connected to the housing.

[0029] As shown in FIG. 1, the gas-fired heating device includes a gas valve 600, an inlet tube 700, a burner 100, a combustion cylinder 800 and an igniter 200. The gas valve 600 has an inlet port and an outlet port, the inlet port is connected with the inlet tube 700, and the outlet port is connected with the burner 100. The inlet tube 700 may be provided with an inlet valve 701, and the inlet valve 701 is used for controlling the flow of the gas entering the gas valve 600 from the inlet tube 700. When the inlet valve 701 is opened, the gas in the inlet tube 700 may enter the gas valve 600; when the inlet valve 701 is closed, no gas flows through the gas valve 600.

[0030] As shown in FIG. 2, the burner 100 includes a body and a gas collecting plate. The body has an inlet end and a combustion end. The inlet end is provided with an inlet port 102, and the inlet port 102 is connected with an outlet port of the gas valve 600. The combustion end is provided with a nozzle 101. The gas from the gas valve 600 enters the body from the inlet port 102 and is ejected out from the nozzle 101.

[0031] The gas collecting plate is concave upwards to form a gas collecting chamber 113. The gas collecting plate is connected with the combustion end, and the gas collecting plate is located above the nozzle 101, so that the gas ejected from the nozzle 101 may enter the gas collecting chamber 113, and the gas collecting chamber 113 can prevent the gas ejected from the nozzle 101 from escaping, so as to reduce the escaping amount of the gas.

[0032] With continued reference to FIG. 1, an igniter 200 is disposed close to the burner 100. As shown in FIG. 3, the igniter 200 has an ignition end 201, the ignition end 201 is located outside the nozzle 101, and the ignition end 201 extends into the gas collecting chamber 113, so that the igniter 200 may ignite the gas in the gas collecting chamber 113. The ignition end 201 extends into the gas collecting chamber 113, which allows the igniter 200 to ignite faster.

[0033] With continued reference to FIG. 1, the combustion cylinder 800 is sleeved outside the nozzle 101, the gas collecting chamber 113 and the igniter 200, and the combustion cylinder 800 can be connected with the clothes drying drum through an air channel. The heat generated by gas combustion in the gas collecting chamber 113 heats the air in the combustion cylinder 800, and the heated air enters the clothes drying drum under the action of the blower fan to dry the clothes in the clothes drying drum.

[0034] The gas in the burner 100 is ejected from the nozzle 101 and gathered in the gas collecting chamber 113, and the ignition end 201 of the igniter 200 extends into the gas collecting chamber 113, so that the gas is mainly combusted in the gas collecting chamber 113. The length of the generated flame in the direction parallel to the gas channel is short, and the flame is away from the inlet port of the air channel, thereby preventing the temperature of the air entering the clothes drying drum from becoming over high and damaging the clothes.

[0035] The body may include a first connecting plate 110 and a second connecting plate 120, and the first connecting

plate 110 is attached to the second connecting plate 120. As shown in FIG. 4, the first connecting plate 110 is provided with a first groove 111, and the first groove 111 is concave away from the second connecting plate 120. As shown in FIG. 5, the second connecting plate 120 is provided with a second groove 121, and the second groove 121 is concave away from the first connecting plate 110. With continued reference to FIG. 2, the second groove 121 is right opposite to the first groove 111, and the gas channel is formed by being enclosed by the second groove 121 and the first groove 111. A nozzle 101 is formed at the end of the gas channel close to the gas collecting chamber 113, and inlet port 102 is formed at the end of the gas channel away from the gas collecting chamber 113. The gas channel is connected with the gas collecting chamber 113 through the nozzle 101. The gas ejected from the nozzle 101 firstly flows into the gas collecting chamber 113, and the gas collecting chamber 113 can reduce the escaping amount of the gas, so that the gas ejected from the nozzle 101 may be ignited by the igniter 200 as much as possible, thereby improving the combustion efficiency of the gas.

[0036] The first connecting plate 110 may be flush with the gas collecting plate, and the first connecting plate 110 and the gas collecting plate may be integrally formed. The first groove 111 and the gas collecting chamber 113 are located on the same side of the second connecting plate 120 to make the structure of the burner 100 simpler.

[0037] In addition to the above structure of the burner 100, the burner 100 may also be formed by welding a gas collecting cover on the basis of the burner 100 in the related art. That is, one end of the burner 100 away from the inlet port 102 is a hemispherical spray head, and an axis of the hemispherical spray head may be parallel to a horizontal plane. A plurality of nozzles 101 are provided on the surface of the hemispherical spray head, and each of the nozzles 101 faces a different direction. Gas is ejected from the nozzles 101. A gas collecting chamber 113 is provided under the gas collecting cover, and the ignition end 201 of the igniter 200 extends into the gas collecting chamber 113. The gas collecting cover in this embodiment can block the escape path of the gas to prevent the gas from escaping to the side of the gas collecting cover away from the igniter 200, so that the gas ejected from the nozzle 101 can be gathered in the gas collecting chamber 113 as much as possible and ignited by the igniter 200, thereby improving the combustion efficiency of the gas.

[0038] With continued reference to FIG. 2 and FIG. 4, in the implementation that the first connecting plate 110 is provided with the first groove 111 and the gas collecting chamber 113, the first groove 111 has a first flow guide groove wall 112, and the first flow guide groove wall 112 is close to the gas collecting chamber 113. The first flow guide groove wall 112 is disposed inclined relative to the first connecting plate 110, and a distance between the first flow guide groove wall 112 and the inlet port 102 increases from the groove bottom of the first groove 111 to the groove opening of the first groove 111. The gas in the first groove 111 may flow to the nozzle 101 along the first flow guide groove wall 112 and then flow into the gas collecting chamber 113, and the first flow guide groove wall 112 makes the gas in the first groove 111 easily flow into the gas collecting chamber 113.

[0039] With continued reference to FIG. 2 and FIG. 5, in the implementation that the second connecting plate 120 is provided with the second groove 121, the second groove 121 has a second flow guide groove wall 122, and the second flow guide groove wall 122 is close to the gas collecting chamber 113. The nozzle 101 is formed by being enclosed by one end of the second flow guide groove wall 122 away from the groove bottom of the second groove 121 and one end of the first flow guide groove wall 112 away from the groove bottom of the first groove 111. The second flow guide groove wall 122 is disposed inclined relative to the second connecting plate 120, and a distance between the second flow guide groove wall 122 and the inlet port 102 increases from the groove bottom of the second groove 121 to the groove opening of the second groove 121. The gas in the second groove 121 may flow into the gas collecting chamber 113 along the second flow guide groove wall 122, and the second flow guide groove wall 122 makes the gas in the second groove 121 easily flow into the gas collecting chamber 113.

[0040] With continued reference to FIG. 2, a projection of one end of the first flow guide groove wall 112 away from the groove bottom of the first groove 111 on a plane where the first connecting plate 110 is located lies within a projection of the second flow guide groove wall 122 on the plane where the first connecting plate 110 is located. Part of the gas flowing through the first flow guide groove wall 112 flows into the gas collecting chamber 113 from the nozzle 101, and the other part directly flows to the second flow guide groove wall 122, and flows to the nozzle 101 along the second flow guide groove wall 122 and then to the gas collecting chamber 113. The second flow guide groove wall 122 can block the gas from the first flow guide groove wall 112, so as to prevent the gas from escaping to the outside of the gas collecting chamber 113, thereby further improving the combustion efficiency of the gas.

[0041] With continued reference to FIG. 5, the gas collecting chamber 113 may include a first side wall 114, a second side wall 115 and a flow guide wall 116. The first side wall 114 is perpendicular to the first connecting plate 110, and the first side wall 114 is parallel to the axis of the gas channel. The second side wall 115 and the first side wall 114 are parallel and spaced apart from each other, the first side wall 114 and the second side wall 115 are connected by the flow guide wall 116, and the gas collecting chamber 113 is formed by being enclosed by the first side wall 114, the second side wall 115 and the flow guide wall 116. One end of the flow guide wall 116 close to the nozzle 101 is connected with one end of the first flow guide groove wall 112 close to the second connecting plate 120, and the gas ejected from the nozzle 101 flows into the gas collecting chamber 113 along the flow guide wall 116.

[0042] With continued reference to FIG. 2, a projection of the flow guide wall 116 on a plane where the first side wall 114 is located is in a circular arc shape. That is, the flow guide wall 116 is in the shape of a curved surface. The gas flowing from

one end of the flow guide wall 116 close to the nozzle 101 to the other end of the flow guide wall 116 turns back after contacting the flow guide wall 116 at the other end and forms turbulent flow in the gas collecting chamber 113. Therefore, the gas in the gas collecting chamber 113 can contact the igniter 200 as much as possible and be ignited by the igniter 200 to improve the combustion efficiency of the gas, and at the same time, the gas may be combusted more fully, thereby reducing the residue of carbon monoxide, making the safety higher and being more energy-saving and environment-friendly.

[0043] With continued reference to FIG. 3, in some embodiments, the angle between the axis of the igniter 200 and the plane where the first connecting plate 110 is located is an acute angle. The igniter 200 further has a fixing end 202 which is closer to the inlet port 102 than the ignition end 201. The igniter 200 is disposed inclined outside the nozzle 101, so that the ignition end 201 is right opposite to the nozzle 101, and the gas may be ignited immediately after being ejected from the nozzle 101, which can effectively reduce the ignition time of the gas-fired clothes dryer. Therefore, the heat generated by gas combustion is exchanged with wet clothes more quickly, thereby effectively improving the drying speed of the clothes.

[0044] Further, an angle between the axis of the igniter 200 and the plane where the first connecting plate 110 is located may be 18° to 30°, so that the contact area between the gas ejected from the nozzle 101 and the ignition end 201 may be increased, and the gas may be ignited by the igniter 200 as much as possible to increase the combustion efficiency of the gas.

[0045] In the implementation that the burner 100 includes the first connecting plate 110 and the second connecting plate 120, the second connecting plate 120 is bent upwards along two ends of the axis perpendicular to the gas channel to form bent plates 123 (as shown in FIG. 5). Slots are formed by being enclosed by the bent plates 123 and the second connecting plate 120, and the first connecting plate 110 is embedded into the slots (as shown in FIG. 6), so that the first connection plate 110 is connected with the second connection plate 120.

[0046] The first connecting plate 110 may be provided with a first connecting hole 117 (as shown in FIG. 4), and the second connecting plate 120 may be provided with a second connecting hole 124 (as shown in FIG. 5). The first connecting hole 117 is right opposite to the second connecting hole 124. A fastening bolt passes through the first connecting hole 117 and the second connecting hole 124 in sequence and then is connected with the mounting bracket 300 (as shown in FIG. 6), so that the burner 100 is detachably connected to the mounting bracket 300.

[0047] With continued reference to FIG. 1, the igniter 200 may be connected to the mounting bracket 300 through a fixing bracket 400. Specifically, as shown in FIG. 7, the fixing bracket 400 includes a first fixing plate 401, a second fixing plate 403 and a clamping part. One end of the second fixing plate 403 is connected with the first fixing plate 401, and the second fixing plate 403 is perpendicular to the first fixing plate 401. The other end of the second fixing plate 403 is connected with the clamping part. One end of the first fixing plate 401 away from the second fixing plate 403 is bent toward the clamping part to form a fastening plate 407, and the fastening plate 407 is perpendicular to the first fixing plate 401. The fastening plate 407, the first fixing plate 401, and the second fixing plate 403 form a clamping slot. A fixing hole 404 is provided on the second fixing plate 403, and the fixing hole 404 extends to the first fixing plate 401. As shown in FIG. 8, the mounting bracket 300 is provided with a mounting plate 301, and the edge of the mounting plate 301 is provided with an insertion block 302. After the insertion block 302 is embedded into the fixing hole 404, the fixing bracket 400 is rotated so that the mounting plate 301 is clamped in the clamping slot (as shown in FIG. 3 and FIG. 6), and the first fixing plate 401 is attached to the mounting plate 301, so as to pre-position the fixing bracket 400 and the mounting bracket 300. The first fixing plate 401 may be provided with a third connecting hole 402, the mounting plate 301 may be provided with a fourth connecting hole, and the fourth connecting hole is right opposite to the third connecting hole 402. A fastening bolt is threaded into the third connecting hole 402 and the fourth connecting hole (as shown in FIG. 6) to fix the mounting plate 301 and the first fixing plate 401.

[0048] With continued reference to FIG. 7, in some embodiments, the clamping part may include a third fixing plate 405. One end of the third fixing plate 405 is connected with one end of the second fixing plate 403 away from the first fixing plate 401, and the other end of the third fixing plate 405 is bent to form a fixing ring 406. The fixing end 202 of the igniter 200 is threaded into the fixing ring 406, so as to fixedly connect the igniter 200 to the fixing bracket 400.

[0049] In other embodiments, the clamping part may include a fixing clip, which may clamp the ignition end 201 of the igniter 200, so as to fix the igniter 200 to the fixing bracket 400.

[0050] With continued reference to FIG. 1, in some embodiments, the gas-fired heating device may further include an air inlet barrel 500. One end of the combustion cylinder 800 is sleeved outside the igniter 200 and the gas collecting chamber 113, the other end of the combustion cylinder 800 extends away from the burner 100, and the diameter of the combustion cylinder 800 decreases in the direction away from the burner 100. The air inlet barrel 500 is sleeved outside one end of the combustion cylinder 800 away from the burner 100, and one end of the combustion cylinder 800 away from the burner 100 is accommodated in the air inlet barrel 500. The axis of the air inlet barrel 500 and the axis of the combustion cylinder 800 may be collinear. The barrel diameter of the air inlet barrel 500 is reduced along the direction away from the burner 100. There is an air inlet clearance 501 between the air inlet barrel 500 and the combustion cylinder 800. The air in the housing enters the air inlet barrel 500 from the air inlet clearance 501, mixes with the hot air in the combustion cylinder 800 and then enters the air channel and flows from the air channel into the clothes drying drum.

[0051] In a case of high power conditions, high loads or poor air paths due to thread debris blockage, the temperature of

the air in the combustion cylinder 800 may be too high. The air entering the air inlet barrel 500 from the air inlet clearance 501 is mixed with the air from the combustion cylinder 800 and then enters the clothes drying drum, so as to reduce the temperature of the air entering the clothes drying drum and avoid damage to the clothes when the temperature is too high.

[0052] With continued reference to FIG. 1, the air inlet barrel 500 and the combustion cylinder 800 may be connected by a fourth fixing plate 502. The fourth fixing plate 502 may include a first plate body 503, a second plate body 504 and a third plate body 505. The first plate body 503 is attached to the outer wall of the combustion cylinder 800. One end of the second plate body 504 is connected with one end of the first plate body 503, and the other end of the second plate body 504 is connected with the air inlet barrel 500. One end of the third plate body 505 is connected with one end of the first plate body 503 away from the second plate body 504, and the other end of the third plate body 505 is connected to the air inlet barrel 500. In the direction from the first plate body 503 towards the air inlet barrel 500, a distance between the second plate body 504 and the third plate body 505 gradually increases. A fastening bolt is connected with the combustion cylinder 800 after passing through the first plate body 503, so as to realize the connection between the air inlet barrel 500 and the combustion cylinder 800.

[0053] As shown in FIG. 9, in the implementation that the body includes the first connecting plate 110 and the second connecting plate 120, the burner 100 may further include a combustion-supporting air conditioner 125. The combustion-supporting air conditioner 125 includes a rotatable tube 126 and an inlet plate 127. The rotatable tube 126 inserted within one end of the gas channel away from the gas collecting chamber 113. The rotatable tube 126 may rotate in the gas channel by taking the axis of the rotatable tube 126 as the center. The inlet plate 127 is disposed at one end of the rotatable tube 126 away from the gas collecting chamber 113 to block the rotatable tube 126, and the inlet plate 127 is perpendicular to the axis of the rotatable tube 126. The inlet plate 127 may be provided with an inlet hole 128. The gas from the gas valve 600 enters the rotatable tube 126 from the inlet hole 128, and flows from the rotatable tube 126 into the gas channel. The wall of the first groove 111 may be provided with a first adjusting opening 129, a first limit hole 130 and a second limit hole 131. The wall of the rotatable tube 126 may be provided with a second adjusting opening 132 and a third limit hole 133. The axes of the third limit hole 133, the first limit hole 130 and the second limit hole 131 are located in the same plane perpendicular to the axis of the rotatable tube 126. The third limit hole 133 is used to be in alignment with the first limit hole 130 or the second limit hole 131, and the third limit hole 133 may be connected with the first limit hole 130 or the second limit hole 131 by a fastening bolt. The flow area of the first adjusting opening 129 and the second adjusting opening 132 when the third limit hole 133 is in alignment with the first limit hole 130 is larger than the flow area of the first adjusting opening 129 and the second adjusting opening 132 when the third limit hole 133 is in alignment with the second limit hole 131.

[0054] With continued reference to FIG. 5, the wall of the second groove 121 may be provided with a third adjusting opening 134, and the third adjusting opening 134 may be right opposite to the first adjusting opening 129. The wall of the rotatable tube 126 may be provided with a fourth adjusting opening, and the fourth adjusting opening may be right opposite to the second adjusting opening 132. The flow area of the third adjusting opening 134 and the fourth adjusting opening is equal to the flow area of the first adjusting opening 129 and the second adjusting opening 132. The flow area of the third adjusting opening 134 and the fourth adjusting opening when the third limit hole 133 is in alignment with the first limit hole 130 is greater than the flow area of the third adjusting opening 134 and the fourth adjusting opening when the third limit hole 133 is in alignment with the second limit hole 131.

[0055] The gas used by the gas-fired clothes dryer may be natural gas or liquefied gas. The amount of combustion-supporting air required by the natural gas and the liquefied gas during combustion is greatly different. For combusting the same volume of natural gas and liquefied gas, the amount of combustion-supporting air required by the liquefied gas is greater than that required by the natural gas.

[0056] As shown in FIG. 10 and FIG. 11, when the gas used in the gas-fired clothes dryer is liquefied gas, the rotatable tube 126 is rotated until the first limit hole 130 is in alignment with the third limit hole 133, and the fastening bolt is threaded into the first limit hole 130 and the third limit hole 133. At this time, the tube wall of the rotatable tube 126 does not block the first adjusting opening 129 and the third adjusting opening 134. That is, the second adjusting opening 132 is completely opposite to the first adjusting opening 129, and the third adjusting opening 134 is completely opposite to the fourth adjusting opening. At this time, the flow area between the first adjusting opening 129 or the third adjusting opening 134 and the gas channel is a first area.

[0057] As shown in FIG. 12, when the gas used in the gas-fired clothes dryer is natural gas, the rotatable tube 126 is rotated until the second limit hole 131 is in alignment with the third limit hole 133, and the fastening bolt is threaded into the second limit hole 131 and the third limit hole 133. At this time, the tube wall of the rotatable tube 126 blocks part of the first adjusting opening 129 and the third adjusting opening 134. That is, part of the second adjusting opening 132 is right opposite to part of the first adjusting opening 129, and part of the third adjusting opening 134 is right opposite to part of the fourth adjusting opening. At this time, the flow area between the first adjusting opening 129 or the third adjusting opening 134 and the gas channel is a second area, and the second area is smaller than the first area, so as to accommodate the amount of combustion-supporting air required for combustion of natural gas.

[0058] When the gas used by the gas-fired clothes dryer needs to be changed, the flow area between the first adjusting opening 129 and the third adjusting opening 134 and the gas channel can be changed by simply rotating the combustion-

supporting air conditioner 125 without replacing the gas valve.

[0059] Further, the first area may be three times the second area. Since the amount of combustion-supporting air required by the liquefied gas is about three times the amount of combustion-supporting air required by the natural gas when the same volume of natural gas and liquefied gas is combusted, by setting the first area to be three times the second area, the gas-fired clothes dryer can achieve a reasonable ratio of gas to combustion-supporting air under either natural gas or liquefied gas operating conditions.

[0060] To sum up, the gas-fired clothes dryer according to embodiments of the present application includes the gas-fired heating device, and the gas-fired heating device include a burner 100 and an igniter 200. The burner includes a body and a gas collecting plate, the gas collecting plate is concave upwards to form a gas collecting chamber 113. The body has a combustion end provided with a nozzle 101. The gas collecting plate is connected with the combustion end, and the gas collecting plate is located above the nozzle 101, so that gas ejected from the nozzle 101 enters the gas collecting chamber 113. The igniter 200 is provided with an ignition end 201 located outside the nozzle 101, and the ignition end 201 extends into the gas collecting chamber 113. By the above arrangement, the gas ejected from the nozzle 101 is firstly gathered in the gas collecting chamber 113, and the gas collecting chamber 113 can prevent the gas ejected from the nozzle 101 from escaping to reduce the escaping amount of the gas, so that the gas ejected from the nozzle 101 can be ignited by the igniter 200 as much as possible, thereby improving the combustion efficiency of the gas.

[0061] Finally, it should be noted that the foregoing embodiments are merely intended for describing the technical solutions of the present application rather than limiting the present application; although the present application is described in detail with reference to the foregoing embodiments, persons of ordinary skill in the art should understand that modification may be made to the technical solutions described in the foregoing embodiments or equivalent substitutions may be made to some or all technical features thereof; and these modifications and substitutions shall not cause the essence of the corresponding technical solutions to depart from the scope of the technical solutions of embodiments of the present application.

Claims

1. A gas-fired heating device, comprising a burner and an igniter, wherein the burner comprises a body and a gas collecting plate, the gas collecting plate is concave upwards to form a gas collecting chamber, and the body has a combustion end provided with a nozzle; the gas collecting plate is connected with the combustion end, and the gas collecting plate is located above the nozzle, so that gas ejected from the nozzle enters the gas collecting chamber; the igniter is provided with an ignition end located outside the nozzle, and the ignition end extends into the gas collecting chamber.

2. The gas-fired heating device according to claim 1, wherein the body comprises a first connecting plate and a second connecting plate, the first connecting plate is attached to the second connecting plate, the first connecting plate is provided with a first groove, and the first groove is concave away from the second connecting plate;
the second connecting plate is provided with a second groove, the second groove is concave away from the first connecting plate, the second groove is right opposite to the first groove, and a gas channel is formed by being enclosed by the second groove and the first groove; the nozzle is formed at one end of the gas channel close to the gas collecting chamber, an inlet port is formed at one end of the gas channel away from the gas collecting chamber, and the gas channel is connected with the gas collecting chamber through the nozzle.

3. The gas-fired heating device according to claim 2, wherein the first groove is provided with a first flow guide groove wall, the first flow guide groove wall is close to the gas collecting chamber, the first flow guide groove wall is disposed inclined relative to the first connecting plate, and a distance between the first flow guide groove wall and the inlet port increases from a groove bottom of the first groove to a groove opening of the first groove.

4. The gas-fired heating device according to claim 2 or 3, wherein the second groove is provided with a second flow guide groove wall, the second flow guide groove wall is close to the gas collecting chamber, the second flow guide groove wall is disposed inclined relative to the second connecting plate, and a distance between the second flow guide groove wall and the inlet port increases from a groove bottom of the second groove to a groove opening of the second groove.

5. The gas-fired heating device according to claim 3, wherein the gas collecting chamber comprises a first side wall, a second side wall and a flow guide wall, the first side wall is perpendicular to the first connecting plate, and the first side wall is parallel to an axis of the gas channel; the second side wall and the first side wall are parallel and spaced apart from each other, and the first side wall and the second side wall are connected through the flow guide wall; the gas collecting chamber is formed by being enclosed by the first side wall, the second side wall and the flow guide wall, and

one end of the flow guide wall close to the nozzle is connected with one end of the first flow guide groove wall close to the second connecting plate.

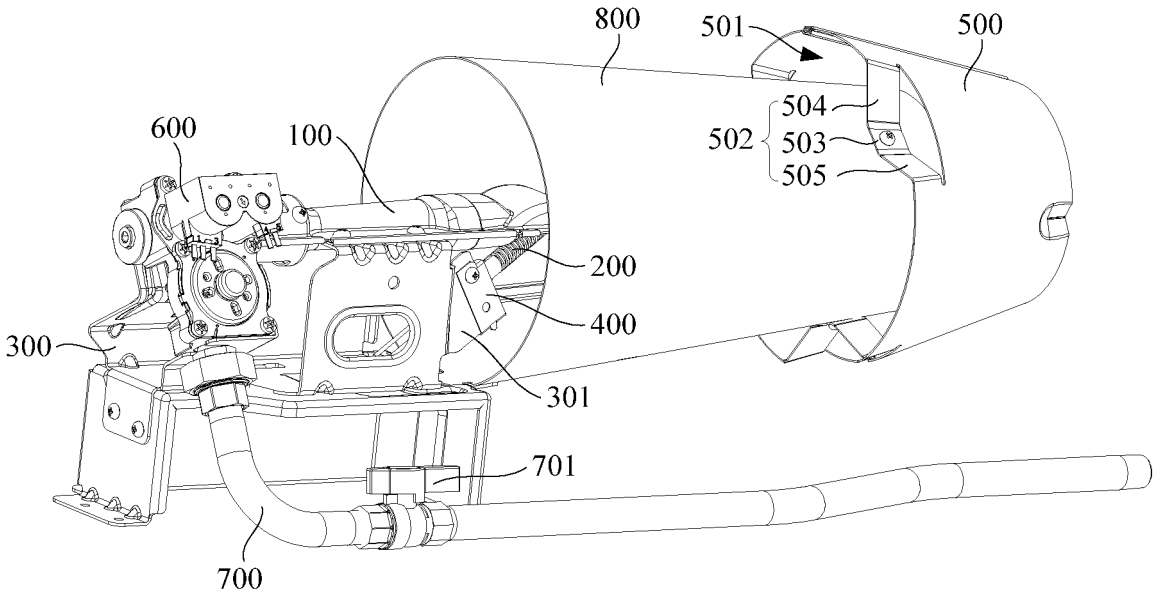
6. The gas-fired heating device according to claim 5, wherein a projection of the flow guide wall on a plane where the first side wall is located is in a circular arc shape.

7. The gas-fired heating device according to any one of claims 2 to 6, wherein an angle between an axis of the igniter and a plane where the first connecting plate is located is an acute angle; the igniter further has a fixing end, and the fixing end is closer to the inlet port than the ignition end.

8. The gas-fired heating device according to any one of claims 2 to 7, wherein the second connecting plate is bent upward along two ends of an axis perpendicular to the gas channel to form bent plates, slots are formed by being enclosed by the bent plates and the second connecting plate, and the first connecting plate is embedded into the slots.

9. The gas-fired heating device according to any one of claims 1 to 8, wherein the gas-fired heating device further comprises a mounting bracket, and the burner and the igniter are both connected to the mounting bracket.

10. A gas-fired clothes dryer, comprising the gas-fired heating device according to any one of claims 1 to 9.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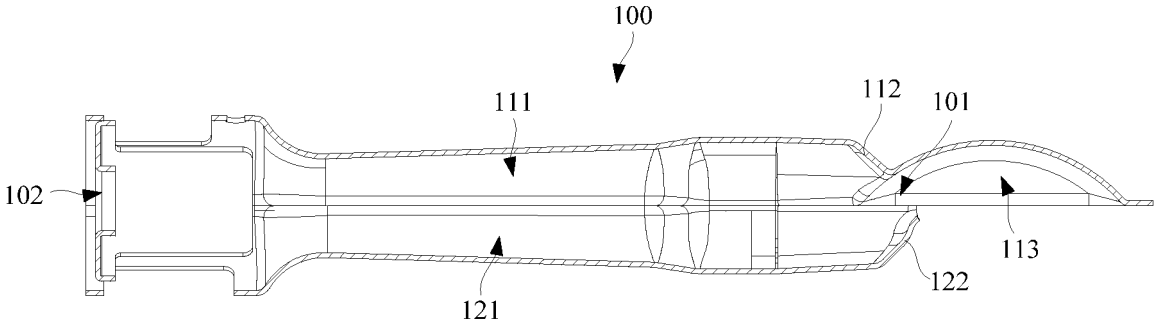
700

FIG. 1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102
113
122
121

FIG. 2

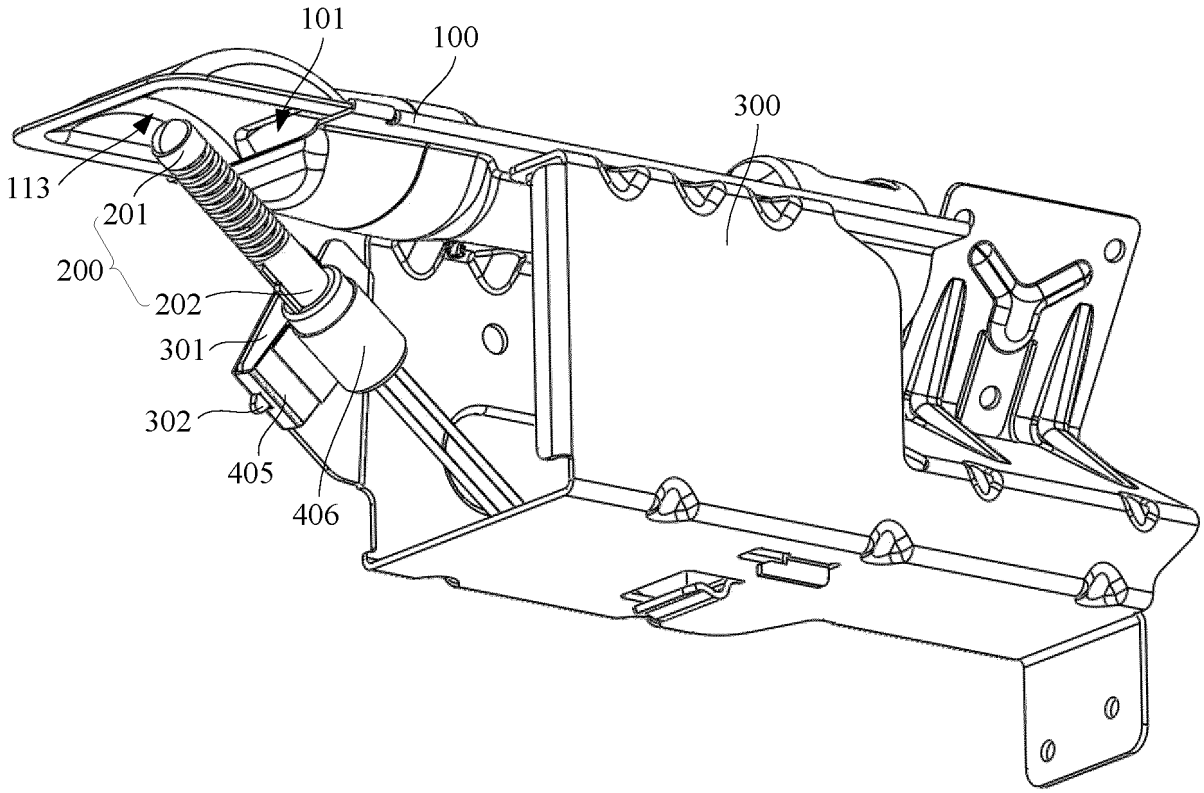

FIG. 3

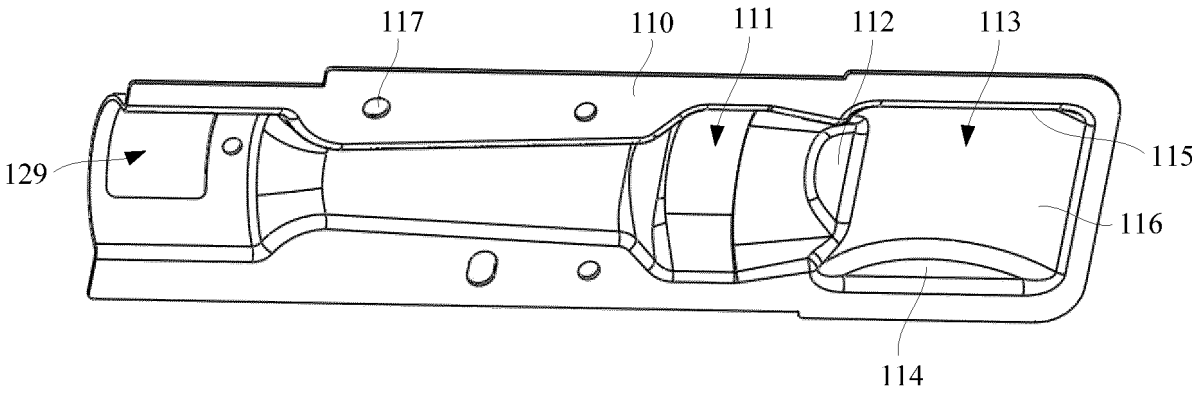

FIG. 4

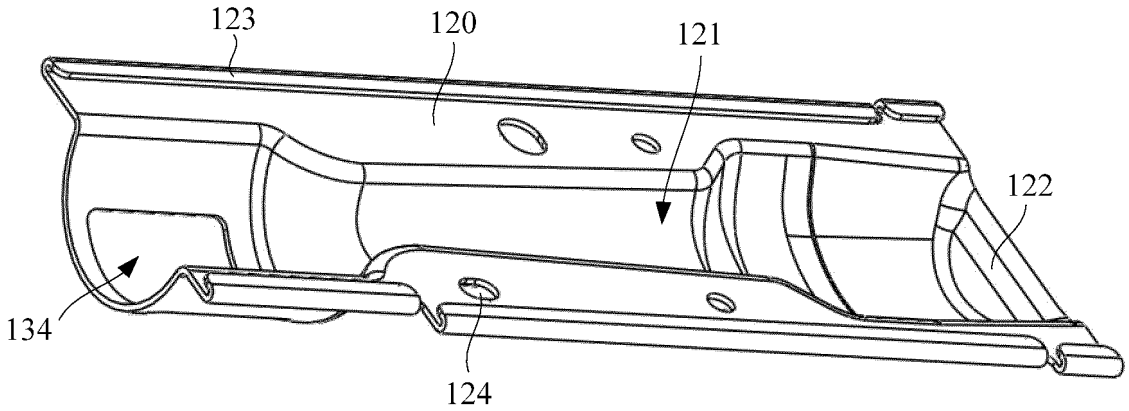

FIG. 5

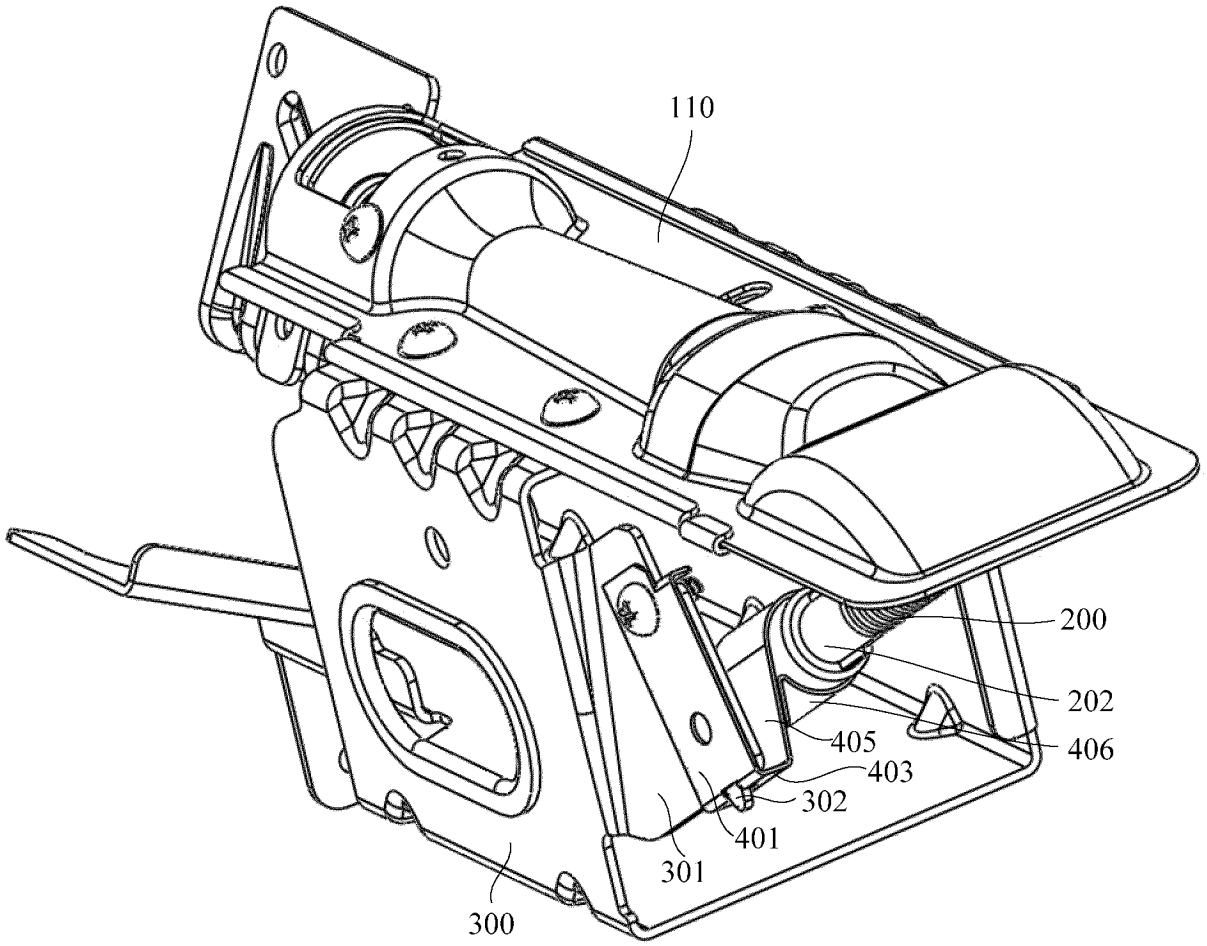

FIG. 6

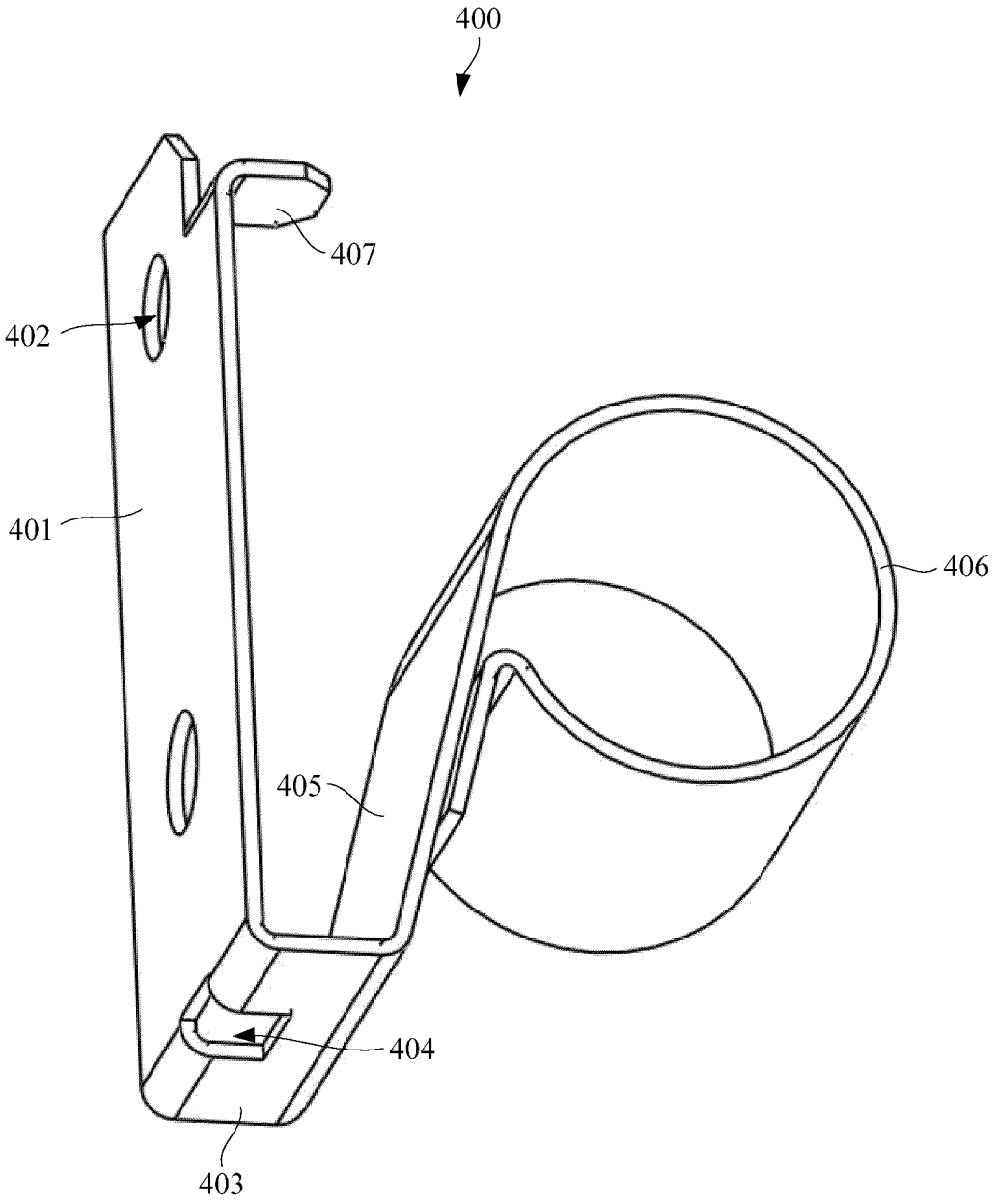

FIG. 7

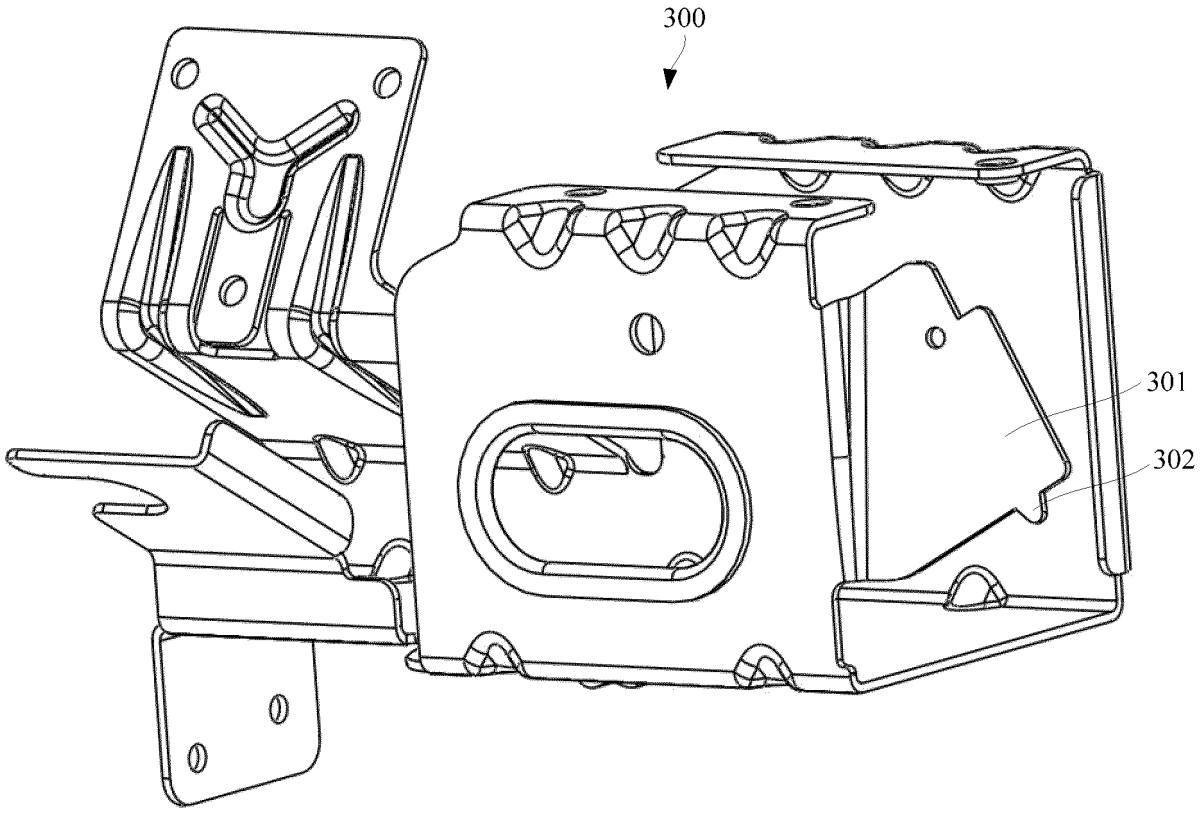

FIG. 8

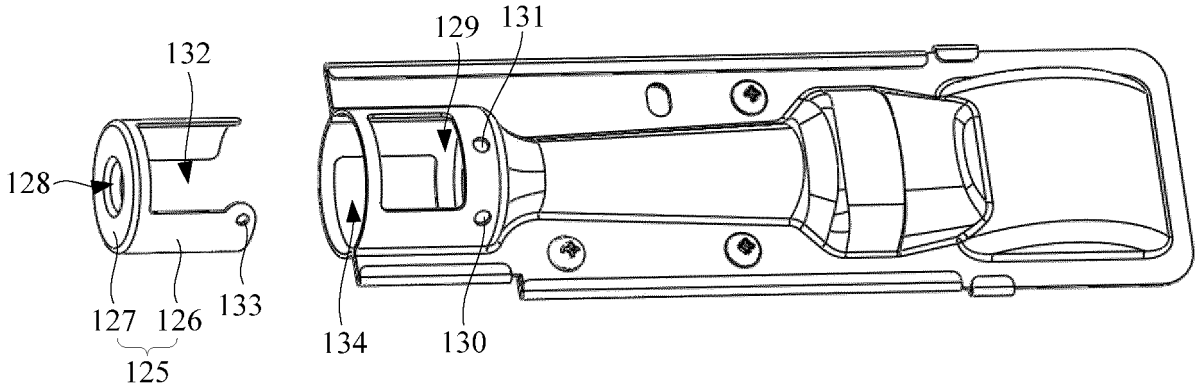

FIG. 9

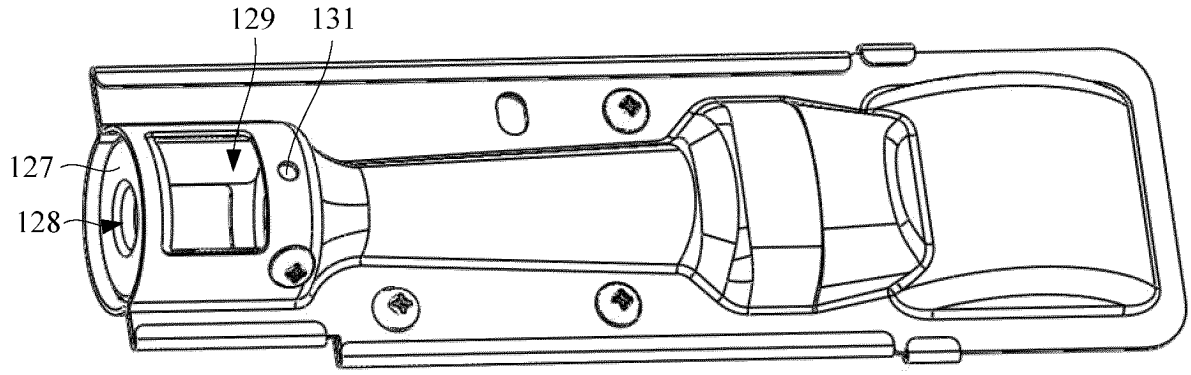

FIG. 10

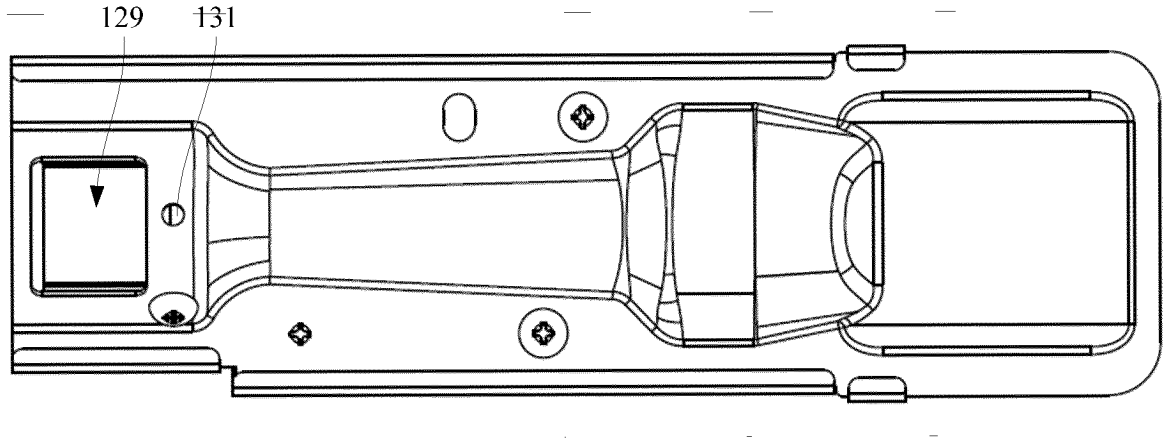

FIG. 11

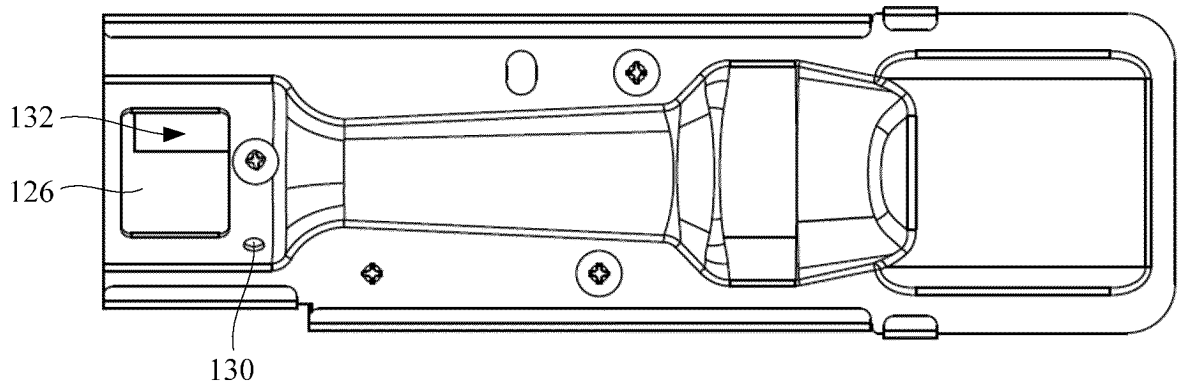

FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/074145

A. CLASSIFICATION OF SUBJECT MATTER

D06F 58/26(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNTXT, ENTXTC, VEN, CNKI: 打火, 挡板, 挡火, 导流, 点火, 点燃, 火花, 集气, 聚集, 聚拢, 聚气, 燃气, 收集, 天然气, 天燃气, 稳定, 稳焰, 液化气, 引导, 引流, gas, Ignit+, fir+, collect+, block+, guid+, gather+, lead+, burn+, spark

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 110864286 A (WUXI LITTLE SWAN ELECTRIC APPLIANCE CO., LTD.) 06 March 2020 (2020-03-06) description, paragraphs [0039]-[0071], and figures 1-10	1-10
Y	CN 112856492 A (NINGBO FOTILE KITCHEN WARE CO., LTD.) 28 May 2021 (2021-05-28) description, paragraphs [0074]-[0092], and figures 1-9	1-10
PX	CN 114561787 A (QINGDAO HAIER WASHING ELECTRIC APPLIANCE CO., LTD. et al.) 30 May 2022 (2022-05-30) description, paragraphs [0060]-[0096], and figures 1-12	1-10
A	CN 109930372 A (QINGDAO HAIER WASHING MACHINE CO., LTD.) 25 June 2019 (2019-06-25) entire document	1-10
A	CN 111336517 A (WUXI LITTLE SWAN ELECTRIC APPLIANCE CO., LTD.) 26 June 2020 (2020-06-26) entire document	1-10

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"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

Date of the actual completion of the international search	Date of mailing of the international search report
22 February 2023	**05 March 2023**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/074145

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 111578323 A (HANGZHOU ROBAM APPLIANCES CO., LTD.) 25 August 2020 (2020-08-25) entire document	1-10
A	CN 1464956 A (LG ELECTRONICS INC.) 31 December 2003 (2003-12-31) entire document	1-10
A	GB 1235139 A (WILLIAM BAILEY BIRMINGHAM LTD.) 09 June 1971 (1971-06-09) entire document	1-10
A	US 2004161720 A1 (LG ELECTRONICS INC.) 19 August 2004 (2004-08-19) entire document	1-10

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/074145

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	110864286	A	06 March 2020	None			
CN	112856492	A	28 May 2021	CN	112856492	B	05 April 2022
CN	114561787	A	30 May 2022	None			
CN	109930372	A	25 June 2019	None			
CN	111336517	A	26 June 2020	None			
CN	111578323	A	25 August 2020	CN	212299082	U	05 January 2021
CN	1464956	A	31 December 2003	US	2004038167	A1	26 February 2004
				US	7204688	B2	17 April 2007
				EP	1407188	A1	14 April 2004
				EP	1407188	B1	06 June 2007
				JP	2004522139	A	22 July 2004
				JP	3845082	B2	15 November 2006
				DE	60220523	D1	19 July 2007
				DE	60220523	T2	07 February 2008
				WO	03008862	A1	30 January 2003
				AU	2002319942	B2	26 May 2005
				KR	20030008639	A	29 January 2003
				AU	2002319942	A1	03 March 2003
				KR	20040008282	A	31 January 2004
				KR	20040008283	A	31 January 2004
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				CN	1228567	C	23 November 2005
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				KR	869503	B1	21 November 2008
				KR	873121	B1	09 December 2008
GB	1235139	A	09 June 1971	FR	2022929	A1	07 August 1970
				DE	1955947	A1	11 June 1970
				BE	741190	A	04 May 1970
US	2004161720	A1	19 August 2004	KR	20040049159	A	11 June 2004
				KR	100937409	B1	18 January 2010
				US	7172413	B2	06 February 2007

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 202210181871 **[0001]**