CONTROL METHOD AND APPARATUS, COOKING APPLIANCE, AND COMPUTER READABLE STORAGE MEDIUM

[0001] This application claims priority to Chinese Patent Application No. 201911127448.9 filed with China National Intellectual Property Administration on November 18, 2019 and entitled "Control method and apparatus, cooking appliance, and computer readable storage medium", and claims priority to Chinese Patent Application No. 201911127450.6 filed with China National Intellectual Property Administration on November 18, 2019 and entitled "Control method and apparatus, cooking appliance, and computer readable storage medium", the entire contents of which are incorporated herein by reference.

FIELD

[0002] The present application relates to the technical field of electric motors, and in particular to a control method and apparatus, cooking appliance, and computer readable storage medium.

BACKGROUND

[0003] Rice production is seasonal and it is impossible to eat new rice at any time. In order to ensure market supply, there must be a certain amount of rice reserves. However, the storage stability of rice is poor, and the cortex is removed during processing, leaving the endosperm directly exposed and easy to age. Meanwhile, even if the user buys newer rice, if the bag is not properly stored, it will also cause the rice to age. Especially in summer (July to September), the influence of high temperature and high humidity gas in the atmosphere on the rice is intensified, making the rice appear darker in color, flavor disappears, acidity increases, sour taste appears, viscosity decreases, and water absorption decreases, water holding capacity decreases, food quality reduces and so on, commonly known as "stale rice".

[0004] Most of the rice sold in the market is stale grain or blended rice. Even new rice is easy to age due to the long storage time or improper storage method of many consumers. Due to the changes in the tissue structure and rice composition of stale rice, the surface rice bran contains more fat and is easily oxidized, and the internal starch structure is denser.

[0005] When using the existing cooking appliance to cook the stale rice according to the existing control method, due to the sour and unpleasant sour taste of the bran produced by the stale rice, the rice cooked by the cooking appliance exudes an unpleasant smell, which covers up the original aroma of the rice, and reduces the viscosity of the rice, tarnished and hard, resulting in poor cooking results. In addition, cooking the stale material with a cooking appliance according to a conventional cooking pattern may result in poor cooking flavor and taste, and may affect the user's experience with the cooking appliance.

[0006] Moreover, any discussion of the background art throughout the specification does not represent that the background art must be prior art known to those skilled in the art, and any discussion of the prior art throughout the specification does not represent that the prior art must be widely known or must constitute common general knowledge in the art.

SUMMARY

[0007] The present application is intended to solve at least one of the technical problems existing in the prior art or related art.

[0008] To this end, a first aspect of the present application proposes a control method.

[0009] A second aspect of the present application provides a control apparatus.

[0010] A third aspect of the present application provides a cooking appliance.

[0011] A fourth aspect of the present application provides a computer readable storage medium.

[0012] A fifth aspect of the present application provides another control method.

[0013] A sixth aspect of the present application provides another control apparatus.

[0014] A seventh aspect of the present application provides another cooking appliance.

[0015] An eighth aspect of the present application provides another computer readable storage medium.

[0016] In view of this, a first aspect of the present application provides a control method applicable to a cooking appliance comprising a cooking portion and an air exchange assembly,

the cooking portion being configured to place material to be cooked, the control method comprising: adjusting, according to a temperature in a working condition of the cooking portion, a working parameter of the air exchange assembly, wherein the air exchange assembly is configured to exchange gas inside the cooking portion with gas outside the cooking portion.

[0017] According to a temperature in a working condition of the cooking portion of the cooking appliance during working, it can be determined that the material in the cooking portion is in a water absorption stage or a heating and temperature rising stage of the cooking process, that is, it can be determined that the cooking processing is before the boiling stage according to a temperature in a working condition of the cooking portion. Before the boiling stage, a pressure difference is formed between the inside and the outside of the cooking portion by using an air exchange assembly of the cooking appliance, so that the gas inside the cooking portion is exchanged with the gas outside the cooking portion, thereby reducing the adsorption of volatile carbonyl compound components by the material, thereby improving the cooking effect of the cooking appliance.

[0018] Specifically, during the storage and placement of rice (or other types of materials), lipids in rice grains are subject to autohydrolysis and oxidative decomposition to form unsaturated free fatty acids, such as oleic acid and linoleic acid, which in turn undergo lipid peroxidation and gradually age to form volatile carbonyl compound components (such as hexanal, nonanal, etc.), which are known as “stale taste” of rice. After the rice is put into the cooking portion and comes into contact with water, the stale substances produced in the rice dissolve in the water, volatilize due to the increase in temperature during the cooking process, and disperse in the air in the cooking portion, and thus people can smell the “stale taste”. In addition, the lipase in rice grains is activated at the oil-water interface, and the activity increases with the increase of water temperature. Lipase can accelerate the oxidation of lipids in rice grains, and rapidly produce volatile carbonyl compound components (stale taste), thus affecting the aroma formation of rice. Therefore, during the working of the cooking appliance, in a water absorption stage to a heating and temperature rising stage (not entering a boiling state), a large amount of volatile carbonyl compound components, such as hexanal and valeraldehyde and other undesirable flavor components, are produced by the material (stale material) under the action of enzymatic hydrolysis, and in this stage, the volatile carbonyl compound components are

discharged out of the cooking portion by adjusting the working parameters of the air exchange assembly to keep the gas inside of the cooking portion in circulation with the gas outside, thereby reducing the adsorption of volatile carbonyl compound components by the material and improving the cooking effect.

[0019] Wherein the working parameters mainly comprise at least one of ventilation direction, ventilation time period and ventilation rate.

[0020] According to the above control method of the present application, the following additional technical features can also be provided.

[0021] In one possible design, the step of adjusting, according to a temperature in a working condition of the cooking portion, a working parameter of the air exchange assembly comprises: detecting a temperature in a working condition of the cooking portion; and adjusting the working parameter of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range.

[0022] On the one hand, the preset temperature range can indicate that the material is in the water absorption and temperature rising stage, and on the other hand, the temperature range in which the material is easy to generate volatile odors; a temperature detection apparatus provided on the cooking portion upper cover can acquire the temperature in a working condition inside the cooking portion; and if a temperature in a working condition of the cooking portion is within the preset temperature range, the material will accelerate the release of volatile substances, and these volatile substances are mostly the furoic acid and stale taste brought by hexanal and valeraldehyde. Therefore, by adjusting the working parameters of the air exchange assembly in the water absorption and temperature rising stages of the material, forced convection can be formed to discharge the furoic acid and stale taste in the cooking portion, thereby reducing the adsorption of undesirable flavors by the material.

[0023] In one possible design, the air exchange assembly comprises an exhaust valve provided on the cooking portion and configured to communicate an interior of the cooking portion with an exterior of the cooking portion, the step of adjusting the working parameter of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range comprises: controlling, if it is detected that the temperature in a working

condition falls within the preset temperature range, the exhaust valve to open according to a preset ventilation time period to exchange gas outside the cooking portion with gas inside the cooking portion.

[0024] The air exchange assembly comprises an exhaust valve, and by opening the exhaust valve, the gas inside the cooking portion can exchange with the gas outside the cooking portion, thereby discharging volatile substances generated during the cooking process, reducing the adsorption of the stale taste volatile substances by materials, and improving the cooking effect.

[0025] In one possible design, the air exchange assembly comprises an air pump, an air passage to which the air pump belongs can communicate the interior of the cooking portion with the atmospheric environment, the step of adjusting the working parameter of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range, further comprises: opening the air passage to which the air pump belongs, and controlling the air pump to perform inflation processing on the cooking portion if it is detected that the temperature in a working condition falls within the preset temperature range, to cause the interior of the cooking portion to rise pressure; and opening an exhaust passage of the cooking appliance, wherein the exhaust passage is configured to discharge gas inside the cooking portion.

[0026] The air exchange assembly comprises an air pump for inflating the interior of the cooking portion by opening the air pump, so that the air pressure inside the cooking portion is greater than the air pressure outside, and volatile odor components generated inside the cooking portion are discharged to the outside of the cooking portion through the opened exhaust passage under the action of the air pressure, thereby discharging volatile substances generated during the cooking process, reducing the adsorption of stale taste volatile substances by materials in the cooking portion, and improving the cooking effect.

[0027] Wherein, the pressure rise refers to a state where the pressure in the cooking portion is greater than a standard atmospheric pressure, that is, a positive pressure is present in the pot.

[0028] In one possible design, the air exchange assembly comprises an air pump, an air passage to which the air pump belongs can communicate the interior of the cooking portion with the atmospheric environment, the step of adjusting the working parameter of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset

temperature range, further comprises: opening an intake passage of the cooking appliance; and opening the air passage to which the air pump belongs, and controlling the air pump to perform an air suction processing so that the interior of the cooking portion is in a negative pressure state, wherein the intake passage is configured to allow gas outside the cooking portion to enter the interior of the cooking portion.

[0029] The air exchange assembly comprises an air pump, wherein the gas inside the cooking portion is drawn out by opening the air pump, so that the air pressure inside the cooking portion is less than the air pressure outside to form a negative pressure state, and the gas outside the cooking portion enters the interior of the cooking portion through the opened intake passage under the effect of the negative pressure.

[0030] Wherein the volatile odor components generated inside the cooking portion are discharged to the outside of the cooking portion via the air suction processing, thereby discharging the volatile substances generated during the cooking process, reducing the adsorption of the materials on the stale taste substances, and improving the cooking effect.

[0031] In one possible design, further comprises: reducing a ventilation volume of the air exchange assembly, and executing a heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, wherein the preset temperature threshold value is greater than or equal to the maximum value of the preset temperature range.

[0032] As the cooking processing advances, the temperature in the cooking portion gradually increases; when the temperature in a working condition detected by a temperature detection apparatus provided in the cooking portion is higher than a preset temperature threshold value, it indicates that the material has gone through a water absorption and temperature rising stage, and most of the volatile carbonyl compounds have been emitted completely and are discharged to the outside of the cooking portion via air convection inside and outside the cooking portion; the subsequent cooking processing is a heating and braising process in which the material generates a cooking aroma; in this stage, the Maillard reaction and the Caramelization reaction are controlled by heating to promote the generation of beneficial flavors of the material; therefore, the ventilation volume of the air exchange assembly should be reduced or the air exchange

assembly should be turned off directly during this stage to maintain the cooking aroma component.

[0033] In one possible design, the cooking appliance further comprises a heating apparatus configured to heat the cooking portion, the step of reducing a ventilation volume of the air exchange assembly, and executing a heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, comprises: reducing the ventilation volume of the air exchange assembly if it is detected that the temperature in a working condition reaches the temperature threshold value; adjusting the heating power of the heating apparatus so that the cooking portion is in a boiling state within a first time period.

[0034] A temperature suitable for cooking the material, that is, a temperature threshold value at which the material can be cooked, can be determined based on the air pressure and the type of material. The temperature in the cooking portion is acquired through the temperature detection apparatus provided in the cooking portion, and when a temperature in a working condition of the cooking portion reaches a temperature suitable for cooking, the power of the heating apparatus is adjusted to keep the temperature in the cooking portion near a temperature threshold value in a first time period, and during this stage, the material is gradually cooked, to improve the cooking effect.

[0035] In one possible design, the step of reducing a ventilation volume of the air exchange assembly, and executing a heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, further comprises: adjusting the heating power of the heating apparatus to a first power to heat the cooking portion to a first temperature, wherein the first temperature is greater than a temperature threshold value, causes the material to generate an odor component.

[0036] By adjusting the power of the heating apparatus to increase the temperature of the interior of the cooking portion from the temperature threshold value to the first temperature, on the one hand, the cooking effect can be improved so that the material can be further cooked, on the other hand, the cooking aroma can be stimulated, and the beneficial aroma of the material after cooking for a first time period in the cooking environment during the temperature threshold value period will also become more apparent.

[0037] In one possible design, the step of reducing a ventilation volume of the air exchange assembly, and executing a heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, further comprises: adjusting a heating power of the heating apparatus to a second power, and timing a duration time period of the second power to reach a second time period.

[0038] By adjusting the heating power of the heating apparatus to a second power, after the second power is maintained for a second time period, the cooking portion is treated with supplementary cooking processing, further improving the taste of the material, and also facilitating the emission of odor of the material.

[0039] In one possible design, the second power is less than the first power, and the second power can be zero.

[0040] In one possible design, the control method further comprises: after a timing reaches the second time period, executing a supplementary cooking processing on the cooking portion according to a third time period, wherein the supplementary cooking processing is configured to supplement heat energy to the interior of the cooking portion.

[0041] Wherein the supplementary cooking processing is to supplement heat energy to the interior of the cooking portion, and the specific implementation method comprises: supplementing hot steam into the cooking portion by a steam generating apparatus to increase the content of heat energy and moisture in the cooking portion; by heating the upper cover of the cooking portion, heat energy can be radiated to the interior of the cooking portion on the one hand, and condensed water droplets on the upper cover can be re-vaporized on the other hand, thereby supplementing heat energy and moisture to the interior of the cooking portion.

[0042] In one possible design, the cooking appliance further comprises an image acquisition apparatus configured to acquire an image of the material inside the cooking portion, prior to the step of adjusting, according to a temperature in a working condition of the cooking portion, a working parameter of the air exchange assembly, further comprises: controlling the image acquisition apparatus to acquire image information of the material; and determining from the image information that the material is a stale material, wherein the stale material is a material having a freshness below a predetermined standard.

[0043] The cooking appliance analyzes the material put into the cooking portion via an image acquisition apparatus to determine whether the material is a stale material, and adjusts the working parameters of the air exchange assembly after determining that the material is a stale material, wherein due to a change in the freshness of the material, a certain change occurs in the appearance of the material, for example, a change in the profile of the material, a change in the color of the material, agglomeration of the material, a decrease in the light reflecting ability of the material and a decrease in the transparency of the material, and whether the material is stale can be determined by acquiring a real-time image of the material and comparing same with a preset image. Adjusting the working parameters of the air exchange assembly in the case where it is determined that the material is stale can improve the cooking effect, and controlling the standby of the air exchange assembly in the case where it is determined that the material is fresh can reduce power consumption.

[0044] A second aspect of the present application provides a control apparatus comprising: a processor that, when executing a computer program, implements the control method according to any one of the embodiments of the first aspect of the present application. Therefore, the technical effects of any one of the embodiments of the above first aspect will not be described in detail herein.

[0045] A third aspect of the present application provides a cooking appliance comprising: the control apparatus according to the embodiment of the second aspect of the present application. The processor of the control apparatus implements the control method according to any one of the embodiments of the first aspect of the present application when executing the computer program. Therefore, the technical effects of any one of the embodiments of the above first aspect will not be described in detail herein.

[0046] According to the cooking appliance disclosed in the third aspect of the present application, in one possible design, the cooking appliance is an electric cooker or a pressure cooker.

[0047] A fourth aspect of the present application provides a computer readable storage medium, and a computer program, when executed by a processor, implements the steps of the control method of any one of the embodiments of the first aspect, and thus has the technical

effects of any one of the embodiments of the above first aspect, and will not be described in detail herein.

[0048] A fifth aspect of the present application provides a control method applicable to a cooking appliance, the cooking appliance comprising a cooking portion and an air exchange assembly, the cooking portion configured to accommodate materials to be cooked, the control method comprising: controlling the air exchange assembly to work according to the first time period so that the cooking portion exchanges gas; and adjusting the power to heat the cooking portion, so that the temperature of the cooking portion undergoing gas exchange is within the first temperature range.

[0049] During the storage and placement of rice (or other types of materials), lipids in rice grains are subject to autohydrolysis and oxidative decomposition to form unsaturated free fatty acids, such as oleic acid and linoleic acid, which in turn undergo lipid peroxidation and gradually age to form volatile carbonyl compound components (such as hexanal, nonanal, etc.), which are known as “stale taste” of rice. After the rice is put into the cooking portion and comes into contact with water, the stale substances produced in the rice dissolve in the water, volatilize due to the increase in temperature during the cooking process, and disperse in the air in the cooking portion, and thus people can smell the “stale taste”. In addition, the lipase in rice grains is activated at the oil-water interface, and the activity increases with the increase of water temperature. Lipase can accelerate the oxidation of lipids in rice grains, and rapidly produce volatile carbonyl compound components (stale taste), thus affecting the aroma formation of rice. In the water absorption stage of rice, temperature and oxygen are combined to accelerate the generation of stale taste substances, and at the same time, air exchange processing is performed in the cooker to take the stale taste substances generated in the storage process and after the rice contacts with water out of the cooker as far as possible.

[0050] For example, the temperature in the water absorption stage of the material is set to 40°C-50°C, at which temperature the activity of lipase is the strongest, and the stale taste substance can be generated as quickly as possible in a limited time, and at the same time, the stale taste substance can be volatilized advantageously at this temperature, and the stale taste substance generated can be removed as much as possible by executing ventilation. In addition, due to the differences in the attribute information of the materials, the lipid content, the

combination mode of starch and other substances and the particle surface area contained therein are all different, the control time of air suction is also adaptively changed. When the cooking appliance is working, in the water absorption stage of the material, the air inside and outside the cooking portion is kept in circulation by controlling the working of the air exchange assembly, to achieve the purpose of discharging the volatile carbonyl compound component out of the cooking portion, reducing the adsorption of the volatile carbonyl compound component by the material, and improving the cooking effect.

[0051] In one possible design, the air exchange assembly comprises an exhaust valve disposed on the cooking portion and configured to communicate an interior of the cooking portion with an exterior of the cooking portion, the gas exchange comprises: controlling the exhaust valve to open so that exterior gas of the cooking portion is exchanged with interior gas of the cooking portion.

[0052] The air exchange assembly comprises an exhaust valve, and by opening the exhaust valve, the gas inside the cooking portion can exchange with the gas outside, thereby discharging volatile substances generated during the cooking process, reducing the adsorption of the stale taste volatile substances by materials, and improving the cooking effect.

[0053] In one possible design, the gas exchange further comprises: controlling the air exchange assembly to perform inflation processing on the cooking portion to rise pressure in the interior of the cooking portion; and opening an exhaust passage of the cooking appliance, wherein the exhaust passage is configured to discharge gas inside the cooking portion.

[0054] By opening the air exchange assembly to inflate the interior of the cooking portion, the air pressure inside the cooking portion is greater than the air pressure outside, volatile odor components generated inside the cooking portion are discharged to the outside of the cooking portion through the opened exhaust passage under the action of the air pressure, and thus discharging volatile substances generated in the cooking process, reducing the adsorption of stale taste volatile substances by materials in the cooking portion, and improving the cooking effect.

[0055] Wherein, the above inflation processing can be achieved by an air pump, that is, the air exchange assembly comprises an air pump, the air passage to which the air pump belongs can communicate an interior of the cooking portion with an exterior of the cooking portion, and a

valve body can be provided in the air passage, and the air pump and the air passage to which the air pump belongs are opened when inflation is required, but the embodiment of inflation is not limited thereto.

[0056] In one possible design, the gas exchange further comprises: opening an intake passage of the cooking appliance; controlling the air exchange assembly to perform an air suction processing so that the interior of the cooking portion is in a negative pressure state, wherein the intake passage is configured to allow gas outside the cooking portion to enter the interior of the cooking portion.

[0057] By opening the air exchange assembly, the gas inside the cooking portion is drawn out, the air pressure inside the cooking portion is less than the air pressure outside, and a negative pressure state is formed, and the gas outside the cooking portion enters the interior of the cooking portion through the opened intake passage under the action of the negative pressure. Wherein, the volatile odor components generated inside the cooking portion are discharged to the outside of the cooking portion via the air suction processing, and thus discharging the volatile substances generated during the cooking process, reducing the adsorption of the stale taste substances by the materials, and improving the cooking effect.

[0058] Wherein, the above air suction processing can be achieved by an air pump, that is, the air exchange assembly comprises an air pump, the air passage to which the air pump belongs can communicate the interior of the cooking portion with the exterior of the cooking portion, and a valve body may be provided in the air passage, and the air pump and the air passage to which the air pump belongs are opened when air suction is required, but the embodiment of air inflation is not limited thereto.

[0059] In one possible design, the control method further comprises: acquiring attribute information of the material; and determining a first time period and/or the first temperature range according to the attribute information of the material.

[0060] By acquiring attribute information of the material, firstly, it may be determined whether a ventilation processing needs to be added during the cooking processing according to the attribute information; when it is determined that the material does not belong to a stale material, the ventilation processing does not need to be performed to reduce the power consumption of the

cooking appliance, and at the same time, it is beneficial to improve the cooking efficiency; and secondly, if the material belongs to the stale material, the first time period and/or the first temperature are determined according to the stale degree.

[0061] Wherein, considering the influence of the material attribute information on the cooking process, providing a temperature which is beneficial for the material to release the odor components as far as possible, determining a ventilation time period according to the material attribute information, and improving the cooking efficiency; after determining a first time period and/or a first temperature range according to the material attribute information, controlling the air exchange assembly to work according to the first time period, and simultaneously adjusting the power for heating the cooking portion, so that the temperature of the cooking portion for gas exchange is within the first temperature range, improving the emission efficiency of the odor components of the material, and bringing the undesirable odor generated by the stale material away from the cooking portion; thus, improving the cooking effect of the cooking appliance.

[0062] It should be particularly pointed out that, due to the differences in the attribute information of the materials, the lipid content, the combination mode of starch and other substances and the particle surface area contained therein are all different, the control time of air suction is also adaptively changed. Therefore, the ventilation time (the first time period) is determined according to the material attribute information, to reduce the heat loss and the loss of beneficial odor of the material caused by opening the ventilation valve for a long time.

[0063] In one possible design, the cooking appliance further comprises an image acquisition apparatus configured to acquire an image of the material inside the cooking portion, prior to the step of controlling the air exchange assembly to work according to the first time period so that the cooking portion exchanges gas: controlling the image acquisition apparatus to acquire image information of the material; and determining the attribute information of the material according to the image information.

[0064] The cooking appliance analyzes the material put into the cooking portion via the image acquisition apparatus to determine attribute information of the material, and determines a first time period and/or a first temperature range according to the attribute information of the material, that is, an appropriate temperature and time period parameters can be selected to control the cooking process.

[0065] Wherein, determining attribute information of the material according to the image information can be achieved by the following process: acquiring image information of a material in a cooking portion, matching the image information with an image in a database, and reading attribute information associated with the matching result image, that is, acquiring the attribute information of the material; or acquiring image information of the material in the cooking portion, analyzing the shape, surface area, color, transparency and reflection of the material in the image information, and determining attribute information of the material.

[0066] For example, according to the image information, it is determined that the material is rice, and the rice will produce odor substances under the decomposition of lipase, and the temperature range with the strongest lipase activity is 40°C-50°C, and using 40°C-50°C as the temperature during ventilation can improve the efficiency of removing rice odor substances; furthermore, it is identified that the rice is round grain-shaped rice such as japonica rice and northeast rice, and the ventilation time period is set at 30 minutes, and the odor substances (stale taste) generated by the rice are discharged as thoroughly as possible; if it is identified that the rice is long grain-shaped rice such as long grain white rice, the ventilation time period can be reduced to 20 minutes to reduce ventilation time period and improve cooking efficiency.

[0067] In one possible design, the cooking appliance further comprises a controller configured to send an instruction signal, prior to the step of controlling the air exchange assembly to work according to a first time period so that the cooking portion exchanges gas, further comprises: determining that the material is a stale material in response to the instruction signal sent after the controller is triggered, wherein the stale material is a material having a freshness below a predetermined standard.

[0068] A controller provided on the cooking appliance identifies whether a material in the cooking portion is a stale material, and when a user needs to cook the stale material, the controller is triggered, that is, determining that the material to be cooked is the stale material, executing ventilation processing during cooking, and discharging gas components (stale taste) generated by the stale material to the outside of the cooking portion, to improve the cooking effect.

[0069] Wherein, the controller may be at least one of a physical key, a touch screen and a processor having a communication function.

[0070] In one possible design, the attribute information of the material comprises any one or a combination of at least two of the following: composition components of the material, content of the composition components of the material, a shape of the material and a surface area of the material.

[0071] A sixth aspect of the present application provides a control apparatus comprises: a processor that, when executing a computer program, implements the control method according to any one of the embodiments of the fifth aspect of the present application. Therefore, the technical effects of any one of the above embodiments of the fifth aspect will not be described in detail herein.

[0072] A seventh aspect of the present application provides a cooking appliance comprises: the control apparatus according to the sixth aspect of the present application. The processor of the control apparatus, when executing the computer program, implements the control method according to any one of the embodiments of the fifth aspect of the present application. Therefore, the technical effects of any one of the above embodiments of the fifth aspect will not be described in detail herein.

[0073] According to the cooking appliance disclosed in the seventh aspect of the present application, in one possible design, the cooking appliance is an electric cooker or a pressure cooker.

[0074] An eighth aspect of the present application provides a computer readable storage medium, and a computer program, when executed by a processor, implements the steps of the control method of any one of the embodiments of the fifth aspect, and thus has the technical effect of any one of the embodiments of the above fifth aspect, which will not be described in detail herein.

[0075] Additional aspects and advantages of the present application will be set forth in part in the description which follows, or may be learned by practice of the present application.

BRIEF DESCRIPTION OF THE DRAWINGS

[0076] The foregoing and/or additional aspects and advantages of the present application will become apparent and readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

[0077] Fig. 1 is a schematic flow diagram of a control method of one embodiment of the present application;

[0078] Fig. 2 is a schematic flow diagram of a control method of another embodiment of the present application;

[0079] Fig. 3 is a schematic block diagram of a control apparatus of one embodiment of the present application;

[0080] Fig. 4 is a schematic block diagram of a cooking appliance of one embodiment of the present application;

[0081] Fig. 5 is a schematic block diagram of a computer readable storage medium of another embodiment of the present application;

[0082] Fig. 6 is a schematic flow diagram of a control method of yet another embodiment of the present application;

[0083] Fig. 7 is a schematic view of a structure of an electric cooker of one embodiment of the present application.

[0084] Wherein the corresponding relationship between the reference numerals and the component names in Figs. 3-5 and 7 is as follows:

[0085] 300: control apparatus; 302: processor; 400: cooking appliance; 500: computer readable storage medium; 502: computer program; 202: air suction apparatus; 204: air duct; 206: controller; 2042: intake port; 2044: outlet port.

DETAILED DESCRIPTION OF THE INVENTION

[0086] In order that the above objects, features and advantages of the present application can be more clearly understood, a more particular description of the present application will be rendered by reference to specific embodiments thereof which are illustrated in the appended

drawings. It should be noted that the embodiments and features of the embodiments of the present application can be combined with each other without conflict.

[0087] In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present application. However, the present application may be implemented otherwise than as specifically described herein. Accordingly, the scope of the present application is not limited by the specific embodiments disclosed below.

[0088] Some embodiments according to the present application are described below with reference to Figs. 1-7.

[0089] Embodiment 1

[0090] As shown in Fig. 1, a control method of one embodiment provided by the present application is applicable to a cooking appliance, the cooking appliance comprising a cooking portion and an air exchange assembly, the cooking portion being configured to accommodate materials to be cooked, the control method mainly comprising: step S102, adjusting, according to a temperature in a working condition of the cooking portion, a working parameter of the air exchange assembly, wherein the air exchange assembly is configured to exchange gas inside the cooking portion with gas outside the cooking portion.

[0091] In this embodiment, it can be determined that the material in the cooking portion is in a water absorption stage or a heating and temperature rising stage of the cooking processing according to a temperature in a working condition of the cooking portion of the cooking appliance when working, that is, it can be determined that the cooking processing is before the boiling stage according to a temperature in a working condition of the cooking portion, before the boiling stage, a pressure difference is formed inside and outside the cooking portion by using an air exchange assembly of the cooking appliance, so that the gas inside the cooking portion is exchanged with the gas outside the cooking portion, thereby reducing the adsorption of volatile carbonyl compounds by the material, thereby improving the cooking effect of the cooking appliance.

[0092] Specifically, during the storage and placement of rice (or other types of materials), lipids in rice grains are subject to autohydrolysis and oxidative decomposition to form unsaturated free fatty acids, such as oleic acid and linoleic acid, which in turn undergo lipid

peroxidation and gradually age to form volatile carbonyl compound components (such as hexanal, nonanal, etc.), which are known as “stale taste” of rice. After the rice is put into the cooking portion and comes into contact with water, the stale substances produced in the rice dissolve in the water, volatilize due to the increase in temperature during the cooking process, and disperse in the air in the cooking portion, and thus people can smell the “stale taste”. In addition, the lipase in rice grains is activated at the oil-water interface, and the activity increases with the increase of water temperature. Lipase can accelerate the oxidation of lipids in rice grains, and rapidly produce volatile carbonyl compound components (stale taste), thus affecting the aroma formation of rice. Therefore, during the working of the cooking appliance, in a water absorption stage to a heating and temperature rising stage (not entering a boiling state), a large amount of volatile carbonyl compound components, such as hexanal and valeraldehyde and other undesirable flavor components, are produced by the material (stale material) under the action of enzymatic hydrolysis, and in this stage, the volatile carbonyl compound components are discharged out of the cooking portion by adjusting the working parameters of the air exchange assembly to keep the gas inside of the cooking portion in circulation with the gas outside, thereby reducing the adsorption of volatile carbonyl compound components by the material and improving the cooking effect.

[0093] Wherein, the working parameters mainly comprise at least one of ventilation direction, ventilation time period and ventilation rate.

[0094] In the above embodiment, the step of adjusting, according to a temperature in a working condition of the cooking portion, the working parameters of the air exchange assembly comprises: detecting a temperature in a working condition of the cooking portion; and adjusting the working parameters of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range.

[0095] In this embodiment, on the one hand, the preset temperature range can indicate that the material is in the water absorption and temperature rising stage, and on the other hand, the temperature range in which the material is easy to generate volatile odors; a temperature detection apparatus provided on the cooking portion upper cover can acquire the temperature in a working condition inside the cooking portion; and if a temperature in a working condition of the cooking portion is within the preset temperature range, the material will accelerate the release of

volatile substances, and these volatile substances are mostly the furoic acid and stale taste brought by hexanal and valeraldehyde. Therefore, by adjusting the working parameters of the air exchange assembly in the water absorption and temperature rising stages of the material, forced convection can be formed to discharge the furoic acid and stale taste in the cooking portion, thereby reducing the adsorption of undesirable flavors by the material.

[0096] In the above embodiment, the air exchange assembly comprises an exhaust valve disposed on the cooking portion and configured to communicate the gas inside of the cooking portion with the gas outside of the cooking portion, the step of adjusting the working parameter of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range comprises: controlling, if it is detected that the temperature in a working condition falls within the preset temperature range, the exhaust valve to open according to a preset ventilation time period to exchange gas outside the cooking portion with gas inside the cooking portion.

[0097] In this embodiment, the air exchange assembly comprises an exhaust valve, and by opening the exhaust valve, the gas inside the cooking portion can exchange with the gas outside, thereby discharging volatile substances generated during the cooking process, reducing the adsorption of the stale taste volatile substances by materials, and improving the cooking effect.

[0098] In the above embodiment, the air exchange assembly comprises an air pump, the air passage to which the air pump belongs can communicate the interior of the cooking portion with the atmospheric environment, the step of adjusting the working parameters of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range, further comprises: opening the air passage to which the air pump belongs, and controlling the air pump to perform inflation processing on the cooking portion if it is detected that the temperature in a working condition falls within the preset temperature range, to cause the interior of the cooking portion to rise pressure; opening an exhaust passage of the cooking appliance, wherein the exhaust passage is configured to discharge gas inside the cooking portion.

[0099] In this embodiment, the air exchange assembly comprises an air pump, and the air pump is opened to inflate the interior of the cooking portion, so that the air pressure inside the cooking portion is greater than the air pressure outside, and the volatile odor components generated inside the cooking portion are discharged to the outside of the cooking portion through

the opened exhaust passage under the action of the air pressure, thereby discharging the volatile substances generated during cooking, reducing the adsorption of the stale taste volatile substances by the materials in the cooking portion, and improving the cooking effect.

[0100] Wherein, the pressure rise refers to a state where the pressure in the cooking portion is greater than a standard atmospheric pressure, that is, a positive pressure is present in the pot.

[0101] In the above embodiment, the air exchange assembly comprises an air pump, the air passage to which the air pump belongs can communicate the interior of the cooking portion with the atmospheric environment, the step of adjusting the working parameter of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range, further comprises: opening the air passage to which the air pump belongs, and controlling the air pump to perform an air suction processing so that the interior of the cooking portion is in a negative pressure state, wherein the intake passage is configured to allow gas outside the cooking portion to enter the interior of the cooking portion.

[0102] In this embodiment, the air exchange assembly comprises an air pump, and by opening the air pump, the gas inside the cooking portion is drawn out, so that the air pressure inside the cooking portion is less than the air pressure outside to form a negative pressure state, and the gas outside the cooking portion enters the interior of the cooking portion through the opened intake passage under the action of the negative pressure.

[0103] Wherein the volatile odor components generated inside the cooking portion are discharged to the outside of the cooking portion via the air suction processing, thereby discharging the volatile substances generated during the cooking process, reducing the adsorption of the materials on the stale taste substances, and improving the cooking effect.

[0104] The above embodiment further comprises: reducing a ventilation volume of the air exchange assembly, and executing a heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, wherein the preset temperature threshold value is greater than or equal to the maximum value of the preset temperature range.

[0105] In this embodiment, as the cooking processing advances, the temperature in the cooking portion gradually increases; when the temperature in a working condition detected by a

temperature detection apparatus provided in the cooking portion is higher than a preset temperature threshold value, it indicates that the material has gone through a water absorption and temperature rising stage, and most of the volatile carbonyl compounds have been emitted completely and are discharged to the outside of the cooking portion via air convection inside and outside the cooking portion; the subsequent cooking processing is a heating and braising process in which the material generates a cooking aroma; in this stage, the Maillard reaction and the Caramelization reaction are controlled by heating to promote the generation of beneficial flavors of the material; therefore, the ventilation volume of the air exchange assembly should be reduced or the air exchange assembly should be turned off directly during this stage to maintain the cooking aroma component.

[0106] In the above embodiment, the cooking appliance further comprises a heating apparatus, wherein the heating apparatus is configured to heat the cooking portion, the step of reducing a ventilation volume of the air exchange assembly, and executing a heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value comprises: reducing the ventilation volume of the air exchange assembly if it is detected that the temperature in a working condition reaches the temperature threshold value; adjusting the heating power of the heating apparatus so that the cooking portion is in a boiling state within the first time period.

[0107] In this embodiment, a temperature suitable for cooking the material, that is, a temperature threshold value, can be determined according to the air pressure and the type of material, and cooking the material at the temperature threshold value can cook the material. The temperature in the cooking portion is acquired through the temperature detection apparatus provided in the cooking portion, and when a temperature in a working condition of the cooking portion reaches a temperature suitable for cooking, the power of the heating apparatus is adjusted to keep the temperature in the cooking portion near a temperature threshold value in a first time period, and during this stage, the material is gradually cooked, to improve the cooking effect.

[0108] In the above embodiment, the step of reducing a ventilation volume of the air exchange assembly, and executing the heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, further comprises: adjusting the heating power of the heating apparatus to a first power to heat the cooking portion

to a first temperature, wherein the first temperature is greater than a temperature threshold value, causes the material to produce an odor component.

[0109] In this embodiment, by adjusting the power of the heating apparatus to raise the temperature inside the cooking portion from the temperature threshold value to the first temperature, on the one hand, the cooking effect can be improved to further cook the material, and on the other hand, the cooking aroma can also be stimulated, and the beneficial aroma generated by the material after cooking for a first time period in the cooking environment during the temperature threshold value period will also become more apparent.

[0110] In the above embodiment, the step of reducing a ventilation volume of the air exchange assembly, and executing the heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, further comprises: adjusting the heating power of the heating apparatus to the second power, and timing the duration time period of the second power to reach the second time period.

[0111] In this embodiment, by adjusting the heating power of the heating apparatus to a second power, after maintaining the second power for a second time period, executing a supplementary cooking processing on the cooking portion, further improving the taste of the material, and also facilitating the emission of odor of the material.

[0112] In one possible design, the second power is less than the first power, and the second power can be zero.

[0113] In the above embodiment, the control method further comprises: after the timing reaches the second time period, executing a supplementary cooking processing on the cooking portion according to a third time period, wherein the supplementary cooking processing is configured to supplement heat energy to the interior of the cooking portion.

[0114] Wherein the supplementary cooking processing is to supplement heat energy to the interior of the cooking portion, and the specific implementation method comprises: supplementing hot steam into the cooking portion by a steam generating apparatus to increase the content of heat energy and moisture in the cooking portion; by heating the upper cover of the cooking portion, heat energy can be radiated to the interior of the cooking portion on the one

hand, and condensed water droplets on the upper cover can be re-vaporized on the other hand, thereby supplementing heat energy and moisture to the interior of the cooking portion.

[0115] In the above embodiment, the cooking appliance further comprises an image acquisition apparatus configured to acquire an image of the material inside the cooking portion, prior to the step of adjusting, according to a temperature in a working condition of the cooking portion, the working parameters of the air exchange assembly further comprises: controlling the image acquisition apparatus to acquire image information of the material; determining from the image information that the material is a stale material, wherein the stale material is a material having a freshness below a predetermined standard.

[0116] In this embodiment, the cooking appliance analyzes the material put into the cooking portion via an image acquisition apparatus to determine whether the material is a stale material, and adjusts the working parameters of the air exchange assembly after determining that the material is a stale material, wherein due to a change in the freshness of the material, a certain change occurs in the appearance of the material, for example, a change in the profile of the material, a change in the color of the material, agglomeration of the material, a decrease in the light reflecting ability of the material and a decrease in the transparency of the material, and whether the material is stale can be determined by acquiring a real-time image of the material and comparing same with a preset image. Adjusting the working parameters of the air exchange assembly in the case where it is determined that the material is stale can improve the cooking effect, and controlling the standby of the air exchange assembly in the case where it is determined that the material is fresh can reduce power consumption.

[0117] Embodiment 2

[0118] As shown in Fig. 2, a control method according to yet another embodiment of the present application is used for controlling an electric cooker. In view of the problem of poor rice cooking flavor of the existing electric cooker, on the one hand, an undesirable flavor component is discharged out of the cooker by a pressure difference between the inside and outside of the cooker, and on the other hand, a beneficial flavor component is generated by heating and braising. The main steps of the control method comprise: step S202, detecting that the temperature of the upper cover of the cooker is less than 100°C; step S204, extracting gas to the outside of the cooker or supplementing gas to the inside of the cooker; step S206, maintaining

the boiling temperature for 8 minutes to 10 minutes; step S208, heating the maximum migration point temperature to 125°C-140°C; step S210, braising rice for more than 12 minutes; step S212, supplementing cooking for 5 minutes.

[0119] In this embodiment, the material to be cooked is rice, and the main flavor substances of rice stale taste are hexanal and valeraldehyde, which slowly pass through the temperature zone where lipase is active at normal temperature or low temperature, and release the hexanal and valeraldehyde to bring about furoic acid and stale taste. In this embodiment, in the water absorption and temperature rising stage of rice, forced convection is formed to discharge the volatile substances in the cooker to the outside of the cooker, to reduce the adsorption of undesirable flavor by rice. In the later stage of rice cooking, Maillard reaction and the Caramelization reaction occur in the ingredients of rice under the action of heat, which can produce beneficial flavor substances and stimulate the aroma of rice. In this embodiment, rice aroma is stimulated to produce more beneficial aroma components by heating time, power, temperature control. Specifically: water absorption to heating and temperature rising stage: at this stage, some undesirable flavor components such as hexanal and valeraldehyde were generated by enzymolysis, and the undesirable flavor components of stale rice were discharged out of the cooker by keeping the circulation between the inside and outside of the rice cooker. When the temperature of the upper cover inside the cooker is less than 100°C, a pressure difference is formed inside and outside the cooker, and there are two solutions as follows:

[0120] A. By using the method of pumping air to the outside of the cooker, the undesirable flavor is forced to be discharged to the outside of the cooker, so that the instantaneous pressure in the cooker P<atmospheric pressure P0, and the external fresh air is replenished to form convection.

[0121] B. The external air is forced into the cooker by replenishing air into the cooker, so that the instantaneous pressure in the cooker P>atmospheric pressure P0, and the undesirable flavor is discharged out of the cooker to form convection.

[0122] Heating and braising stage: in this stage, the Maillard reaction and the Caramelization reaction are controlled by heating to stimulate the beneficial flavor of rice.

[0123] Beginning at 100°C, maintain boiling time of 8-10 min, ensure sufficient boiling time, transfer temperature of heating maximum point of 125-140°C, reduce air convection in braising stage, braising time of above 12 min, supplement cooking time of 5 min.

[0124] Embodiment 3

[0125] As shown in Fig. 3, the embodiment of the present application further discloses a control apparatus 300 comprising a processor 302 which, when executing a computer program, implements the control method according to any one of Embodiment One or Embodiment Two. Therefore, the technical effects of any of the above embodiments are acquired, which will not be described in detail herein.

[0126] Wherein, the above control apparatus 300 comprises at least one logic computing device of a MCU (Micro-programmed Control Unit), a CPU (Central Processing Unit), a DSP (Digital Signal Processor), a single chip microcomputer and an embedded device.

[0127] Embodiment 4

[0128] As shown in Fig. 4, the embodiment of the present application also provides a cooking appliance 400 comprising: the control apparatus 300 according to Embodiment 3 of the present application.

[0129] The processor of the control apparatus 300, when executing a computer program, implements the steps of the control method according to any of the embodiments of the present application. Therefore, the technical effects of the control method according to any of the above embodiments are acquired, which will not be described in detail.

[0130] In one possible design, the cooking appliance 400 is an electric cooker or a pressure cooker.

[0131] Embodiment 5

[0132] As shown in Fig. 5, the embodiment of the present application also provides a computer readable storage medium 500, wherein a computer program 502 is stored, and when executed by a processor, the computer program 502 realizes the steps of the control method disclosed in any one of the above embodiments, and thus has the technical effects of the control method of any one of the above embodiments, which will not be described in detail herein.

[0133] In this embodiment, the computer program 502 when executed by a processor implements the following steps of:

[0134] In this embodiment, it can be determined that the material in the cooking portion is in a water absorption stage or a heating and temperature rising stage of the cooking processing according to a temperature in a working condition of the cooking portion of the cooking appliance when working, that is, it can be determined that the cooking processing is before the boiling stage according to a temperature in a working condition of the cooking portion, before the boiling stage, a pressure difference is formed inside and outside the cooking portion by using an air exchange assembly of the cooking appliance, so that the gas inside the cooking portion is exchanged with the gas outside the cooking portion, thereby reducing the adsorption of volatile carbonyl compounds by the material, thereby improving the cooking effect of the cooking appliance.

[0135] Specifically, during the storage and placement of rice (or other types of materials), lipids in rice grains are subject to autohydrolysis and oxidative decomposition to form unsaturated free fatty acids, such as oleic acid and linoleic acid, which in turn undergo lipid peroxidation and gradually age to form volatile carbonyl compound components (such as hexanal, nonanal, etc.), which are known as “stale taste” of rice. After the rice is put into the cooking portion and comes into contact with water, the stale substances produced in the rice dissolve in the water, volatilize due to the increase in temperature during the cooking process, and disperse in the air in the cooking portion, and thus people can smell the “stale taste”. In addition, the lipase in rice grains is activated at the oil-water interface, and the activity increases with the increase of water temperature. Lipase can accelerate the oxidation of lipids in rice grains, and rapidly produce volatile carbonyl compound components (stale taste), thus affecting the aroma formation of rice. Therefore, during the working of the cooking appliance, in a water absorption stage to a heating and temperature rising stage (not entering a boiling state), a large amount of volatile carbonyl compound components, such as hexanal and valeraldehyde and other undesirable flavor components, are produced by the material (stale material) under the action of enzymatic hydrolysis, and in this stage, the volatile carbonyl compound components are discharged out of the cooking portion by adjusting the working parameters of the air exchange assembly to keep the gas inside of the cooking portion in circulation with the gas outside,

thereby reducing the adsorption of volatile carbonyl compound components by the material and improving the cooking effect.

[0136] Wherein the working parameters mainly comprise at least one of ventilation direction, ventilation time period and ventilation rate.

[0137] In the above embodiment, the step of adjusting, according to a temperature in a working condition of the cooking portion, the working parameters of the air exchange assembly comprises: detecting a temperature in a working condition of the cooking portion; adjusting the working parameters of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range.

[0138] In this embodiment, on the one hand, the preset temperature range can indicate that the material is in the water absorption and temperature rising stage, and on the other hand, the temperature range in which the material is easy to generate volatile odors; a temperature detection apparatus provided on the cooking portion upper cover can acquire the temperature in a working condition inside the cooking portion; and if a temperature in a working condition of the cooking portion is within the preset temperature range, the material will accelerate the release of volatile substances, and these volatile substances are mostly the furoic acid and stale taste brought by hexanal and valeraldehyde. Therefore, by adjusting the working parameters of the air exchange assembly in the water absorption and temperature rising stages of the material, forced convection can be formed to discharge the furoic acid and stale taste in the cooking portion, thereby reducing the adsorption of undesirable flavors by the material.

[0139] In the above embodiment, the air exchange assembly comprises an exhaust valve provided on the cooking portion and configured to communicate the interior of the cooking portion with the exterior of the cooking portion, the step of adjusting the working parameter of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range comprises: controlling, if it is detected that the temperature in a working condition falls within the preset temperature range, the exhaust valve to open according to a preset ventilation time period to exchange gas outside the cooking portion with gas inside the cooking portion.

[0140] In this embodiment, the air exchange assembly comprises an exhaust valve, and by opening the exhaust valve, the gas inside the cooking portion can exchange with the gas outside, thereby discharging volatile substances generated during the cooking process, reducing the adsorption of the stale taste volatile substances by materials, and improving the cooking effect.

[0141] In the above embodiment, the air exchange assembly comprises an air pump, the air passage to which the air pump belongs can communicate the interior of the cooking portion with the atmospheric environment, the step of adjusting the working parameter of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range, further comprises: opening the air passage to which the air pump belongs, and controlling the air pump to perform inflation processing on the cooking portion if it is detected that the temperature in a working condition falls within the preset temperature range, to cause the interior of the cooking portion to rise pressure; and opening an exhaust passage of the cooking appliance, wherein the exhaust passage is configured to discharge gas inside the cooking portion.

[0142] In this embodiment, the air exchange assembly comprises an air pump, and the air pump is opened to inflate the interior of the cooking portion, so that the air pressure inside the cooking portion is greater than the air pressure outside, and the volatile odor components generated inside the cooking portion are discharged to the outside of the cooking portion through the opened exhaust passage under the action of the air pressure, thereby discharging the volatile substances generated during cooking, reducing the adsorption of the stale taste volatile substances by the materials in the cooking portion, and improving the cooking effect.

[0143] In the above embodiment, the air exchange assembly comprises an air pump, the air passage to which the air pump belongs can communicate the interior of the cooking portion with the atmospheric environment, the step of adjusting the working parameter of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range, further comprises: opening the air passage to which the air pump belongs, and controlling the air pump to perform an air suction processing so that the interior of the cooking portion is in a negative pressure state, wherein the intake passage is configured to allow gas outside the cooking portion to enter the interior of the cooking portion.

[0144] In this embodiment, the air exchange assembly comprises an air pump, and by opening the air pump, the gas inside the cooking portion is drawn out, so that the air pressure inside the

cooking portion is less than the air pressure outside to form a negative pressure state, and the gas outside the cooking portion enters the interior of the cooking portion through the opened intake passage under the action of the negative pressure.

[0145] Wherein the volatile odor components generated inside the cooking portion are discharged to the outside of the cooking portion via the air suction processing, thereby discharging the volatile substances generated during the cooking process, reducing the adsorption of the materials on the stale taste substances, and improving the cooking effect.

[0146] The above embodiment further comprises: reducing the ventilation volume of the air exchange assembly, and executing a heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, wherein the preset temperature threshold value is greater than or equal to the maximum value of the preset temperature range.

[0147] In this embodiment, as the cooking processing advances, the temperature in the cooking portion gradually increases; when the temperature in a working condition detected by a temperature detection apparatus provided in the cooking portion is higher than a preset temperature threshold value, it indicates that the material has gone through a water absorption and temperature rising stage, and most of the volatile carbonyl compounds have been emitted completely and are discharged to the outside of the cooking portion via air convection inside and outside the cooking portion; the subsequent cooking processing is a heating and braising process in which the material generates a cooking aroma; in this stage, the Maillard reaction and the Caramelization reaction are controlled by heating to promote the generation of beneficial flavors of the material; therefore, the ventilation volume of the air exchange assembly should be reduced or the air exchange assembly should be turned off directly during this stage to maintain the cooking aroma component.

[0148] In the above embodiment, the cooking appliance further comprises a heating apparatus, wherein the heating apparatus is configured to heat the cooking portion, the step of reducing a ventilation volume of the air exchange assembly, and executing a heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value comprises: reducing the ventilation volume of the air exchange assembly if it is detected that the temperature in a working condition reaches the temperature threshold value;

and adjusting the heating power of the heating apparatus so that the cooking portion is in a boiling state within the first time period.

[0149] In this embodiment, a temperature suitable for cooking the material, that is, a temperature threshold value, can be determined according to the air pressure and the type of material, and cooking the material at the temperature threshold value can cook the material. The temperature in the cooking portion is acquired through the temperature detection apparatus provided in the cooking portion, and when a temperature in a working condition of the cooking portion reaches a temperature suitable for cooking, the power of the heating apparatus is adjusted to keep the temperature in the cooking portion near a temperature threshold value in a first time period, and during this stage, the material is gradually cooked, to improve the cooking effect.

[0150] In the above embodiment, the step of reducing a ventilation volume of the air exchange assembly, and executing the heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, further comprises: adjusting the heating power of the heating apparatus to a first power to heat the cooking portion to a first temperature, wherein the first temperature is greater than a temperature threshold value, causes the material to produce an odor component.

[0151] In this embodiment, by adjusting the power of the heating apparatus to raise the temperature inside the cooking portion from the temperature threshold value to the first temperature, on the one hand, the cooking effect can be improved to further cook the material, and on the other hand, the cooking aroma can also be stimulated, and the beneficial aroma generated by the material after cooking for a first time period in the cooking environment during the temperature threshold value period will also become more apparent.

[0152] In the above embodiment, the step of reducing a ventilation volume of the air exchange assembly, and executing the heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, further comprises: adjusting the heating power of the heating apparatus to the second power, and timing the duration time period of the second power to reach the second time period.

[0153] In this embodiment, by adjusting the heating power of the heating apparatus to a second power, after maintaining the second power for a second time period, executing a supplementary

cooking processing on the cooking portion, further improving the taste of the material, and also facilitating the emission of odor of the material.

[0154] In one possible design, the second power is less than the first power, and the second power can be zero.

[0155] In the above embodiment, the control method further comprises: after the timing reaches the second time period, executing a supplementary cooking processing on the cooking portion according to a third time period, wherein the supplementary cooking processing is configured to supplement heat energy to the interior of the cooking portion.

[0156] Wherein the supplementary cooking processing is to supplement heat energy to the interior of the cooking portion, and the specific implementation method comprises: supplementing hot steam into the cooking portion by a steam generating apparatus to increase the content of heat energy and moisture in the cooking portion; by heating the upper cover of the cooking portion, heat energy can be radiated to the interior of the cooking portion on the one hand, and condensed water droplets on the upper cover can be re-vaporized on the other hand, thereby supplementing heat energy and moisture to the interior of the cooking portion.

[0157] In the above embodiment, the cooking appliance further comprises an image acquisition apparatus configured to acquire an image of the material inside the cooking portion, prior to the step of adjusting, according to a temperature in a working condition of the cooking portion, a working parameter of the air exchange assembly, further comprises: controlling the image acquisition apparatus to acquire image information of the material; and determining from the image information that the material is a stale material, wherein the stale material is a material having a freshness below a predetermined standard.

[0158] In this embodiment, the cooking appliance analyzes the material put into the cooking portion via an image acquisition apparatus to determine whether the material is a stale material, and adjusts the working parameters of the air exchange assembly after determining that the material is a stale material, wherein due to a change in the freshness of the material, a certain change occurs in the appearance of the material, for example, a change in the profile of the material, a change in the color of the material, agglomeration of the material, a decrease in the light reflecting ability of the material and a decrease in the transparency of the material, and

whether the material is stale can be determined by acquiring a real-time image of the material and comparing same with a preset image. Adjusting the working parameters of the air exchange assembly in the case where it is determined that the material is stale can improve the cooking effect, and controlling the standby of the air exchange assembly in the case where it is determined that the material is fresh can reduce power consumption.

[0159] The embodiment of the present application is described in detail above with reference to the accompanying drawings, and in view of the existing technical problems, a control method and apparatus, cooking appliance, and computer readable storage medium are provided. A pressure difference is generated by controlling a working state of the air exchange assembly, so that air exchange is performed between the interior and the exterior of the cooking portion, volatile carbonyl compound components generated by the materials are discharged out of a pot, adsorption of the material for bad flavor is reduced, and a cooking effect is improved.

[0160] Embodiment 6

[0161] As shown in Fig. 6, a control method according to one embodiment of the present application is applicable to the cooking appliance, the cooking appliance comprising a cooking portion configured to place material to be cooked and an air exchange assembly, the control method comprises:

[0162] step S102, controlling the air exchange assembly to work according to the first time period, so that the cooking portion exchanges gas; and

[0163] step S104, adjusting the power to heat the cooking portion, so that the temperature of the cooking portion subjected to the gas exchange is within the first temperature range.

[0164] In this embodiment, during the storage and placement of rice (or other types of materials), lipids in rice grains are subject to autohydrolysis and oxidative decomposition to form unsaturated free fatty acids, such as oleic acid and linoleic acid, which in turn undergo lipid peroxidation and gradually age to form volatile carbonyl compound components (such as hexanal, nonanal, etc.), which are known as “stale taste” of rice.

[0165] After the rice is put into the cooking portion and comes into contact with water, the stale substances produced in the rice dissolve in the water, volatilize due to the increase in

temperature during the cooking process, and disperse in the air in the cooking portion, and thus people can smell the “stale taste”.

[0166] In addition, the lipase in rice grains is activated at the oil-water interface, and the activity increases with the increase of water temperature. Lipase can accelerate the oxidation of lipids in rice grains, and rapidly produce volatile carbonyl compound components (stale taste), thus affecting the aroma formation of rice.

[0167] In the water absorption stage of rice, temperature and oxygen are combined to accelerate the generation of stale taste substances, and at the same time, air exchange processing is performed in the cooker to take the stale taste substances generated in the storage process and after the rice contacts with water out of the cooker as far as possible.

[0168] For example, the temperature in the water absorption stage of the material is set to 40°C-50°C, at which temperature the activity of lipase is the strongest, and the stale taste substance can be generated as quickly as possible in a limited time, and at the same time, the stale taste substance can be volatilized advantageously at this temperature, and the stale taste substance generated can be removed as much as possible by executing ventilation.

[0169] When the cooking appliance is working, in the water absorption stage of the material, the air inside and outside the cooking portion is kept in circulation by controlling the working of the air exchange assembly, to achieve the purpose of discharging the volatile carbonyl compound component out of the cooking portion, reducing the adsorption of the volatile carbonyl compound component by the material, and improving the cooking effect.

[0170] In the above embodiment, the air exchange assembly comprises an exhaust valve provided on the cooking portion and configured to communicate the interior of the cooking portion with the exterior of the cooking portion, and the gas exchange comprises: controlling the exhaust valve to open so that exterior gas of the cooking portion is exchanged with interior gas of the cooking portion.

[0171] In this embodiment, the air exchange assembly comprises an exhaust valve, and by opening the exhaust valve, the gas inside the cooking portion can exchange with the gas outside, thereby discharging volatile substances generated during cooking, reducing the absorption of stale taste volatile substances by materials and improving the cooking effect.

[0172] In the above embodiment, the air passage to which the air exchange assembly belongs can communicate the interior of the cooking portion with the atmospheric environment, and the gas exchange further comprises: controlling the air exchange assembly to perform inflation processing on the cooking portion to rise pressure in the interior of the cooking portion; and opening an exhaust passage of the cooking appliance, wherein the exhaust passage is configured to discharge gas inside the cooking portion.

[0173] In this embodiment, the air exchange assembly is opened to inflate the interior of the cooking portion, so that the air pressure inside the cooking portion is greater than the air pressure outside, and the volatile odor components generated inside the cooking portion are discharged to the outside of the cooking portion through the opened exhaust passage under the action of the air pressure, thereby discharging the volatile substances generated during the cooking process, reducing the adsorption of the stale taste volatile substances by the materials in the cooking portion, and improving the cooking effect.

[0174] Wherein, the pressure rise refers to a state where the pressure in the cooking portion is greater than a standard atmospheric pressure, that is, a positive pressure is present in the pot.

[0175] In the above embodiment, the air passage to which the air exchange assembly belongs can communicate the interior of the cooking portion with the atmospheric environment, and the gas exchange further comprises: opening an intake passage of the cooking appliance; and controlling the air exchange assembly to perform an air suction processing so that the interior of the cooking portion is in a negative pressure state, wherein the intake passage is configured to allow gas outside the cooking portion to enter the interior of the cooking portion.

[0176] In this embodiment, the gas inside the cooking portion is drawn out by opening the air exchange assembly, so that the air pressure inside the cooking portion is less than the air pressure outside to form a negative pressure state, and the gas outside the cooking portion enters the interior of the cooking portion through the opened intake passage under the action of the negative pressure.

[0177] Wherein the volatile odor components generated inside the cooking portion are discharged to the outside of the cooking portion via the air suction processing, thereby

discharging the volatile substances generated during the cooking process, reducing the adsorption of the materials on the stale taste substances, and improving the cooking effect.

[0178] In the above embodiment, the control method further comprises: acquiring attribute information of the material; determining the first time period and/or the first temperature range according to the attribute information of the material.

[0179] In the embodiment, by acquiring attribute information of the material, firstly, it may be determined whether a ventilation processing needs to be added during the cooking processing according to the attribute information; when it is determined that the material does not belong to a stale material, the ventilation processing does not need to be performed to reduce the power consumption of the cooking appliance, and at the same time, it is beneficial to improve the cooking efficiency; and secondly, if the material belongs to the stale material, the first time period and/or the first temperature are determined according to the stale degree.

[0180] Wherein, considering the influence of the material attribute information on the cooking process, providing a temperature which is beneficial for the material to release the odor components as far as possible, determining a ventilation time period according to the material attribute information, and improving the cooking efficiency; after determining a first time period and/or a first temperature range according to the material attribute information, controlling the air exchange assembly to work according to the first time period, and simultaneously adjusting the power for heating the cooking portion, so that the temperature of the cooking portion for gas exchange is within the first temperature range, improving the emission efficiency of the odor components of the material, and bringing the undesirable odor generated by the stale material away from the cooking portion; thus, improving the cooking effect of the cooking appliance.

[0181] It should be particularly pointed out that, due to the differences in the attribute information of the materials, the lipid content, the combination mode of starch and other substances and the particle surface area contained therein are all different, the control time of air suction is also adaptively changed. Therefore, the ventilation time (the first time period) is determined according to the material attribute information, to reduce the heat loss and the loss of beneficial odor of the material caused by opening the ventilation valve for a long time.

[0182] In the above embodiment, the cooking appliance further comprises an image acquisition apparatus configured to acquire an image of the material in the cooking portion, prior to the step of controlling the air exchange assembly to work according to the first time period so that the cooking portion exchanges gas, further comprises: controlling the image acquisition apparatus to acquire image information of the material; and determining the attribute information of the material according to the image information.

[0183] In this embodiment, the cooking appliance analyzes the material put into the cooking portion via the image acquisition apparatus to determine attribute information of the material, and determines a first time period and/or a first temperature range according to the attribute information of the material, that is, an appropriate temperature and time period parameters can be selected to control the cooking process.

[0184] Wherein, determining attribute information of the material according to the image information can be achieved by the following process: acquiring image information of a material in a cooking portion, matching the image information with an image in a database, and reading attribute information associated with the matching result image, that is, acquiring the attribute information of the material; or acquiring image information of the material in the cooking portion, analyzing the shape, surface area, color, transparency and reflection of the material in the image information, and determining attribute information of the material.

[0185] For example, according to the image information, it is determined that the material is rice, and the rice will produce odor substances under the decomposition of lipase, and the temperature range with the strongest lipase activity is 40°C-50°C, and using 40°C-50°C as the temperature during ventilation can improve the efficiency of removing rice odor substances; furthermore, it is identified that the rice is round grain-shaped rice such as japonica rice and northeast rice, and the ventilation time period is set at 30 minutes, and the odor substances (stale taste) generated by the rice are discharged as thoroughly as possible; if it is identified that the rice is long grain-shaped rice such as long grain white rice, the ventilation time period can be reduced to 20 minutes to reduce ventilation time period and improve cooking efficiency.

[0186] In the above embodiment, the cooking appliance further comprises a controller configured to send an instruction signal, prior to the step of controlling the air exchange assembly to work according to a first time period so that the cooking portion exchanges gas,

further comprises: determining that the material is a stale material in response to the instruction signal sent after the controller is triggered, wherein the stale material is a material having a freshness below a predetermined standard.

[0187] In this embodiment, a controller provided on the cooking appliance identifies whether a material in the cooking portion is a stale material, and when a user needs to cook the stale material, the controller is triggered, that is, determining that the material to be cooked is the stale material, executing ventilation processing during cooking, and discharging gas components (stale taste) generated by the stale material to the outside of the cooking portion, to improve the cooking effect.

[0188] Wherein, the controller may be at least one of a physical key, a touch screen and a processor having a communication function.

[0189] In the above embodiment, the attribute information of the material comprises any one or a combination of at least two of the following: composition components of the material, content of the composition components of the material, a shape of the material and a surface area of the material.

[0190] Embodiment 7

[0191] According to a control method of still another embodiment of the present application, the control method is used to control an electric cooker, and a structural diagram of the electric cooker is shown in Fig. 7, and the electric cooker comprises: an air suction apparatus 202, an air duct 204 and a controller 206, wherein one end of the air duct is connected to the inside of the electric cooker and one end thereof is connected to the atmospheric environment, and the control method comprises:

[0192] 1. for round grain-shaped rice such as japonica rice and northeast rice, the control method of the air suction apparatus 202 is as follows:

[0193] entering the water absorption stage → starting the air suction apparatus 202 → maintaining for 30 min (the temperature in the cooker is controlled at 40°C-50°C) → closing the air suction apparatus 202 → entering the next stage of cooking.

[0194] 2. for long grain-shaped rice such as long grain white rice, the control method of the air suction apparatus 202 is as follows:

[0195] entering the water absorption stage → starting the air suction apparatus 202 → maintaining for 20 min (the temperature in the cooker is controlled at 40°C-50°C) → closing the air suction apparatus 202 → entering the next stage of cooking.

[0196] In this embodiment, the air duct 204 acts as a gas delivery channel; the air suction apparatus 202 may be a vacuum pump or other apparatuses capable of extracting the gas in the cooker, an air duct 204 is connected to the air suction apparatus 202, the air duct 204 has an intake port 2042 and an outlet port 2044, the air duct 204 is connected to the cooker, and the outlet port 2044 is connected to air.

[0197] In the first stage of rice cooking, that is, the water absorption stage, temperature and oxygen are combined to accelerate the generation of stale taste substances, and air suction processing is performed in the cooker to take the stale taste substances (generated in the storage process and after the rice contacts with water) out of the cooker as far as possible.

[0198] The temperature at this stage is set at 40°C-50°C, at which stage the lipase is most active, producing as fast a stale taste substance as possible in a limited time.

[0199] At the same time, the temperature facilitates the volatilization of the stale taste material, at which time the air suction arrangement is performed to remove as much stale taste material as possible.

[0200] As the characteristics of japonica and indica rice, the lipid content, the combination mode of starch and other substances and the particle surface area contained therein are all different, the control time of air suction is also set differently.

[0201] Embodiment 8

[0202] As shown in Fig. 3, the embodiment of the present application further discloses a control apparatus 300 comprising a processor 302 which, when executing a computer program, implements the control method according to any one of Embodiment One or Embodiment Seven. Therefore, the technical effects of any of the above embodiments are acquired, which will not be described in detail herein.

[0203] Wherein, the above control apparatus 300 comprises at least one logic computing device of a MCU (Micro-programmed Control Unit), a CPU (Central Processing Unit), a DSP (Digital Signal Processor), a single chip microcomputer and an embedded device.

[0204] Embodiment 9

[0205] As shown in Fig. 4, the embodiment of the present application also provides a cooking appliance 400 comprising: the control apparatus 300 according to Embodiment 8 of the present application. The processor of the control apparatus 300, when executing a computer program, implements the steps of the control method according to any of the embodiments of the present application. Therefore, the technical effects of the control method according to any of the above embodiments are acquired, which will not be described in detail. In one possible design, the cooking appliance 400 is an electric cooker or a pressure cooker.

[0206] Embodiment 10

[0207] As shown in Fig. 5, the embodiment of the present application also provides a computer readable storage medium 500, in which a computer program 502 is stored, and when executed by a processor, the computer program 502 realizes the steps of the control method disclosed in any of the above embodiments, and thus has the technical effect of the control method of any of the above embodiments, which will not be described in detail herein.

[0208] In this embodiment, the computer program 502 when executed by a processor implements the following steps of:

[0209] controlling the air exchange assembly to work according to the first time period so that the cooking portion exchanges gas; and adjusting the power to heat the cooking portion, so that the temperature of the cooking portion undergoing gas exchange is within the first temperature range.

[0210] In this embodiment, during the storage and placement of rice (or other types of materials), lipids in rice grains are subject to autohydrolysis and oxidative decomposition to form unsaturated free fatty acids, such as oleic acid and linoleic acid, which in turn undergo lipid peroxidation and gradually age to form volatile carbonyl compound components (such as hexanal, nonanal, etc.), which are known as “stale taste” of rice. After the rice is put into the

cooking portion and comes into contact with water, the stale substances produced in the rice dissolve in the water, volatilize due to the increase in temperature during the cooking process, and disperse in the air in the cooking portion, and thus people can smell the “stale taste”. In addition, the lipase in rice grains is activated at the oil-water interface, and the activity increases with the increase of water temperature. Lipase can accelerate the oxidation of lipids in rice grains, and rapidly produce volatile carbonyl compound components (stale taste), thus affecting the aroma formation of rice. In the water absorption stage of rice, temperature and oxygen are combined to accelerate the generation of stale taste substances, and at the same time, air exchange processing is performed in the cooker to take the stale taste substances generated in the storage process and after the rice contacts with water out of the cooker as far as possible.

[0211] For example, the temperature in the water absorption stage of the material is set to 40°C-50°C, at which temperature the activity of lipase is the strongest, and the stale taste substance can be generated as quickly as possible in a limited time, and at the same time, the stale taste substance can be volatilized advantageously at this temperature, and the stale taste substance generated can be removed as much as possible by executing ventilation. In addition, due to the differences in the attribute information of the materials, the lipid content, the combination mode of starch and other substances and the particle surface area contained therein are all different, the control time of air suction is also adaptively changed. When the cooking appliance is working, in the water absorption stage of the material, the air inside and outside the cooking portion is kept in circulation by controlling the working of the air exchange assembly, to achieve the purpose of discharging the volatile carbonyl compound component out of the cooking portion, reducing the adsorption of the volatile carbonyl compound component by the material, and improving the cooking effect.

[0212] In the above embodiment, the air exchange assembly comprises an exhaust valve provided on the cooking portion and configured to be able to communicate the interior of the cooking portion with the exterior of the cooking portion, and the gas exchange comprises: controlling the exhaust valve to open so that the exterior gas of the cooking portion is exchanged with the interior gas of the cooking portion.

[0213] In this embodiment, the air exchange assembly comprises an exhaust valve, and by opening the exhaust valve, the gas inside the cooking portion can exchange with the gas outside,

thereby discharging volatile substances generated during cooking, reducing the absorption of stale taste volatile substances by materials and improving the cooking effect.

[0214] In the above embodiment, the air passage to which the air exchange assembly belongs can communicate the interior of the cooking portion with the atmospheric environment, and the gas exchange further comprises: controlling the air exchange assembly to inflate the cooking portion to rise pressure in the interior of the cooking portion; opening an exhaust passage of the cooking appliance, wherein the exhaust passage is configured to discharge gas inside the cooking portion.

[0215] In this embodiment, the air exchange assembly is opened to inflate the interior of the cooking portion, so that the air pressure inside the cooking portion is greater than the air pressure outside, and the volatile odor components generated inside the cooking portion are discharged to the outside of the cooking portion through the opened exhaust passage under the action of the air pressure, thereby discharging the volatile substances generated during the cooking process, reducing the adsorption of the stale taste volatile substances by the materials in the cooking portion, and improving the cooking effect.

[0216] Wherein, the pressure rise refers to a state where the pressure in the cooking portion is greater than a standard atmospheric pressure, that is, a positive pressure is present in the pot.

[0217] In the above embodiment, the air passage to which the air exchange assembly belongs can communicate the interior of the cooking portion with the atmospheric environment, and the gas exchange further comprises: opening an intake passage of the cooking appliance; controlling the air exchange assembly to perform an air suction processing so that the interior of the cooking portion is in a negative pressure state, wherein the intake passage is configured to allow gas outside the cooking portion to enter the interior of the cooking portion.

[0218] In this embodiment, the gas inside the cooking portion is drawn out by opening the air exchange assembly, so that the air pressure inside the cooking portion is less than the air pressure outside to form a negative pressure state, and the gas outside the cooking portion enters the interior of the cooking portion through the opened intake passage under the action of the negative pressure. Wherein the volatile odor components generated inside the cooking portion are discharged to the outside of the cooking portion via the air suction processing, thereby

discharging the volatile substances generated during the cooking process, reducing the adsorption of the materials on the stale taste substances, and improving the cooking effect.

[0219] In the above embodiment, the control method further comprises: acquiring attribute information of the material; determining a first time period and/or a first temperature range based on the attribute information of the material.

[0220] In the embodiment, by acquiring attribute information of the material, firstly, it may be determined whether a ventilation processing needs to be added during the cooking process according to the attribute information; when it is determined that the material does not belong to a stale material, the ventilation processing does not need to be performed to reduce the power consumption of the cooking appliance, and at the same time, it is beneficial to improve the cooking efficiency; and secondly, if the material belongs to the stale material, the first time period and/or the first temperature are determined according to the stale degree.

[0221] Wherein, considering the influence of the material attribute information on the cooking process, providing a temperature which is beneficial for the material to release the odor components as far as possible, determining a ventilation time period according to the material attribute information, and improving the cooking efficiency; after determining a first time period and/or a first temperature range according to the material attribute information, controlling the air exchange assembly to work according to the first time period, and simultaneously adjusting the power for heating the cooking portion, so that the temperature of the cooking portion for gas exchange is within the first temperature range, improving the emission efficiency of the odor components of the material, and bringing the undesirable odor generated by the stale material away from the cooking portion; thus, improving the cooking effect of the cooking appliance.

[0222] It should be particularly pointed out that, due to the differences in the attribute information of the materials, the lipid content, the combination mode of starch and other substances and the particle surface area contained therein are all different, the control time of air suction is also adaptively changed. Therefore, the ventilation time (the first time period) is determined according to the material attribute information, to reduce the heat loss and the loss of beneficial odor of the material caused by opening the ventilation valve for a long time.

[0223] In the above embodiment, the cooking appliance further comprises an image acquisition apparatus configured to acquire an image of the material in the cooking portion, the first time period and/or the first temperature range being determined by the following steps of: controlling the image acquisition apparatus to acquire image information of the material; determining attribute information of the material according to the image information.

[0224] In this embodiment, the cooking appliance analyzes the material put into the cooking portion via the image acquisition apparatus to determine attribute information of the material, and determines a first time period and/or a first temperature range according to the attribute information of the material, that is, an appropriate temperature and time period parameters can be selected to control the cooking process.

[0225] Wherein, determining attribute information of the material according to the image information can be achieved by the following process: acquiring image information of a material in a cooking portion, matching the image information with an image in a database, and reading attribute information associated with the matching result image, that is, acquiring the attribute information of the material; or acquiring image information of the material in the cooking portion, analyzing the shape, surface area, color, transparency and reflection of the material in the image information, and determining attribute information of the material.

[0226] For example, according to the image information, it is determined that the material is rice, and the rice will produce odor substances under the decomposition of lipase, and the temperature range with the strongest lipase activity is 40°C-50°C, and using 40°C-50°C as the temperature during ventilation can improve the efficiency of removing rice odor substances; furthermore, it is identified that the rice is round grain-shaped rice such as japonica rice and northeast rice, and the ventilation time period is set at 30 minutes, and the odor substances (stale taste) generated by the rice are discharged as thoroughly as possible; if it is identified that the rice is long grain-shaped rice such as long grain white rice, the ventilation time period can be reduced to 20 minutes to reduce ventilation time period and improve cooking efficiency.

[0227] In the above embodiment, the cooking appliance further comprises a controller capable of sending an instruction signal, prior to the step of controlling working of the air exchange assembly for a first time period to cause the cooking portion to exchange gas, further comprises: determining that the material is a stale material in response to an instruction signal issued after

the controller is triggered, wherein the stale material is a material having a freshness below a predetermined standard.

[0228] In this embodiment, a controller provided on the cooking appliance identifies whether a material in the cooking portion is a stale material, and when a user needs to cook the stale material, the controller is triggered, that is, determining that the material to be cooked is the stale material, executing ventilation processing during cooking, and discharging gas components (stale taste) generated by the stale material to the outside of the cooking portion, to improve the cooking effect.

[0229] Wherein, the controller may be at least one of a physical key, a touch screen and a processor having a communication function.

[0230] In the above embodiment, the attribute information of the material comprises any one or a combination of at least two of the following: the composition components of the material, the content of the composition components of the material, the shape of the material and the surface area of the material.

[0231] The embodiment of the present application is described in detail above with reference to the accompanying drawings, and in view of the existing technical problems, a control method and apparatus, cooking appliance, and computer readable storage medium are provided, wherein an air exchange assembly is controlled to generate a pressure difference inside and outside a cooking portion, volatile carbonyl compound components generated by a material are discharged out of a cooker, and according to attribute information of the material, a ventilation time period and a temperature during ventilation are determined, to improve ventilation efficiency, reduce the adsorption of undesirable flavors by the material and improve the cooking effect.

[0232] In this application, the terms “first”, “second”, and “third” are used for descriptive purposes only and are not to be construed as indicating or implying relative importance; the term “a plurality of” refers to two or more than two, unless explicitly defined otherwise. The terms “mounted”, “linked”, “connected”, “fixed”, and the like are to be construed broadly, e.g., “connected” may be a fixed connection, may be a detachable connection, or may be an integral connection; “linked” may be either directly or indirectly linked through an intermediary. For a

person of ordinary skill in the art, the specific meaning of the above terms in the present application can be understood according to specific situations.

[0233] In the description of the present application, it is to be understood that the terms "upper", "lower", "left", "right", "front", "back", and the like indicate orientations or positional relationships based on the orientation or positional relationships shown in the figures, are merely used for convenience in describing and simplifying the present application, and do not indicate or imply that the referenced apparatuses or units must have a particular orientation, be constructed and operated in a particular orientation, and thus, are not to be construed as limiting the present application.

[0234] In the description of this specification, references to "one embodiment", "some embodiments", "particular embodiments", etc. mean that a particular feature, structure, material, or characteristic described in connection with the embodiment or example is contained in at least one embodiment or example of the present application. In this specification, schematic representations of the above terms do not necessarily refer to the same embodiment or example. Furthermore, the particular features, structures, materials, or characteristics described may be combined in any suitable manner in any one or more embodiments or examples.

[0235] The foregoing is merely a preferred embodiment of the present application and is not intended to limit the present application so that various modifications and changes may be made by those skilled in the art. All modifications, equivalent substitutions, improvements, etc., come within the spirit and scope of the present application are intended to be embraced therein.

WHAT IS CLAIMED IS:

1. A control method, applicable to a cooking appliance comprising a cooking portion and an air exchange assembly, the cooking portion being configured to accommodate materials to be cooked, wherein the control method comprises:

adjusting, according to a temperature in a working condition of the cooking portion, a working parameter of the air exchange assembly, wherein the air exchange assembly is configured to exchange gas inside the cooking portion with gas outside the cooking portion,

reducing a ventilation volume of the air exchange assembly, and executing a heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, wherein the preset temperature threshold value is greater than or equal to a maximum value of the preset temperature range.

2. The control method according to claim 1, wherein the step of adjusting, according to a temperature in a working condition of the cooking portion, a working parameter of the air exchange assembly comprises:

detecting a temperature in a working condition of the cooking portion; and

controlling the air exchange assembly to operate according to a preset working parameter if it is detected that the temperature in a working condition falls within a preset temperature range.

3. The control method according to claim 2, wherein the air exchange assembly comprises an exhaust valve provided on the cooking portion and configured to communicate an interior of the cooking portion with an exterior of the cooking portion, the step of adjusting a working parameter of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range comprises:

controlling, if it is detected that the temperature in a working condition falls within the preset temperature range, the exhaust valve to open according to a preset ventilation time period to exchange gas outside the cooking portion with gas inside the cooking portion.

4. The control method according to claim 2, wherein the air exchange assembly comprises an air pump, an air passage to which the air pump belongs can communicates the interior of the cooking portion with the atmospheric environment,

the step of adjusting the working parameter of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range, further comprises:

opening the air passage to which the air pump belongs, and controlling the air pump to perform inflation processing on the cooking portion if it is detected that the temperature in a working condition falls within the preset temperature range, to cause the interior of the cooking portion to rise pressure; and

opening an exhaust passage of the cooking appliance,

wherein the exhaust passage is configured to discharge gas inside the cooking portion.

5. The control method according to claim 2, wherein the air exchange assembly comprises an air pump, an air passage to which the air pump belongs can communicates the interior of the cooking portion with the atmospheric environment,

the step of adjusting the working parameter of the air exchange assembly if it is detected that the temperature in a working condition falls within a preset temperature range, further comprises:

opening an intake passage of the cooking appliance; and

opening the air passage to which the air pump belongs, and controlling the air pump to perform an air suction processing so that the interior of the cooking portion is in a negative pressure state,

wherein the intake passage is configured to allow gas outside the cooking portion into the cooking portion.

6. The control method according to any one of claims 1 to 5, wherein the cooking appliance further comprises a heating apparatus configured to heat the cooking portion,

the step of reducing a ventilation volume of the air exchange assembly, and executing a heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value comprises:

reducing the ventilation volume of the air exchange assembly if it is detected that the temperature in a working condition reaches the temperature threshold value; and

adjusting a heating power of the heating apparatus so that the cooking portion is in a boiling state within a first time period.

7. The control method according to claim 6, wherein the step of reducing a ventilation volume of the air exchange assembly, and executing a heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, further comprises:

adjusting a heating power of the heating apparatus to a first power to heat the cooking portion to a first temperature, wherein the first temperature is greater than the temperature threshold value.

8. The control method according to claim 7, wherein the step of reducing a ventilation volume of the air exchange assembly, and executing a heating and braising process if it is detected that the temperature in a working condition is higher than a preset temperature threshold value, further comprises:

adjusting a heating power of the heating apparatus to a second power, and timing a duration time period of the second power to reach a second time period.

9. The control method according to claim 8, further comprises:

after a timing reaches the second time period, executing a supplementary cooking processing on the cooking portion according to a third time period,

wherein the supplementary cooking processing is configured to supplement heat energy to the interior of the cooking portion.

10. The control method according to any one of claims 1 to 5, wherein the cooking appliance further comprises an image acquisition apparatus configured to acquire an image of material inside the cooking portion, prior to the step of adjusting, according to a temperature in a working condition of the cooking portion, a working parameter of the air exchange assembly, further comprises:

controlling the image acquisition apparatus to acquire image information of the material; and

determining from the image information that the material is a stale material.

11. A control apparatus, comprising:

a memory;

a processor; and

a program stored on the memory and executable on the processor, which when executed by the processor implements the steps of the control method according to any one of claims 1 to 11.

12. A cooking appliance, comprising:

the control apparatus as claimed in claim 11.

13. The cooking appliance according to claim 12, wherein

the cooking appliance is an electric cooker or a pressure cooker.

14. A computer readable storage medium, having stored thereon a computer program, wherein

the computer program, when executed, implements the steps of the control method according to any one of claims 1 to 10.

15. A control method, applicable to a cooking appliance comprising a cooking portion, an air exchange assembly, and an image acquisition apparatus, the cooking portion being configured to accommodate materials to be cooked, the image acquisition apparatus being configured to acquire an image of material inside the cooking portion, wherein the control method comprising:

controlling the image acquisition apparatus to acquire image information of the material;

determining an attribute information of the material according to the image information;

controlling the air exchange assembly to work according to a first time period so that the cooking portion exchanges gas; and

adjusting a power to heat the cooking portion, so that the temperature of the cooking portion subjected to the gas exchange is within a first temperature range.

16. The control method according to claim 15, wherein the air exchange assembly comprises an exhaust valve provided on the cooking portion and configured to communicate an interior of the cooking portion with an exterior of the cooking portion, the gas exchange comprises:

controlling the exhaust valve to open so that exterior gas of the cooking portion is exchanged with interior gas of the cooking portion.

17. The control method according to claim 15, wherein the gas exchange further comprises:

controlling the air exchange assembly to perform inflation processing on the cooking portion to rise pressure in the interior of the cooking portion; and

opening an exhaust passage of the cooking appliance,

wherein the exhaust passage is configured to discharge gas inside the cooking portion.

18. The control method according to claim 15, wherein the gas exchange further comprises:

opening an intake passage of the cooking appliance; and

controlling the air exchange assembly to perform an air suction process so that the interior of the cooking portion is in a negative pressure state,

wherein the intake passage is configured to allow gas outside the cooking portion into the cooking portion.

19. The control method according to any one of claims 15 to 18, further comprises:

acquiring the attribute information of the material; and

determining the first time period and/or the first temperature range according to the attribute information of the material.

20. The control method according to any one of claims 15 to 18, wherein the cooking appliance further comprises a controller configured to send an instruction signal, prior to the step of controlling the air exchange assembly to work according to a first time period so that the cooking portion exchanges gas, further comprises:

determining that the material is a stale material in response to the instruction signal sent after the controller is triggered.

21. The control method according to claim 20, wherein

the attribute information of the material comprises any one or a combination of at least two of the following:

composition components of the material, content of the composition components of the material, a shape of the material and a surface area of the material.

22. A control apparatus, comprising:

a memory;

a processor; and

a program stored on the memory and executable on the processor, which when executed by the processor, implements the steps of the control method according to any one of claims 15 to 21.

23. A cooking appliance, comprising:

the control apparatus as claimed in claim 22.

24. The cooking appliance according to claim 23, wherein

the cooking appliance is an electric cooker or a pressure cooker.

25. A computer readable storage medium, having stored thereon a computer program, which when executed, implements the steps of the control method according to any one of claims 15 to 21.