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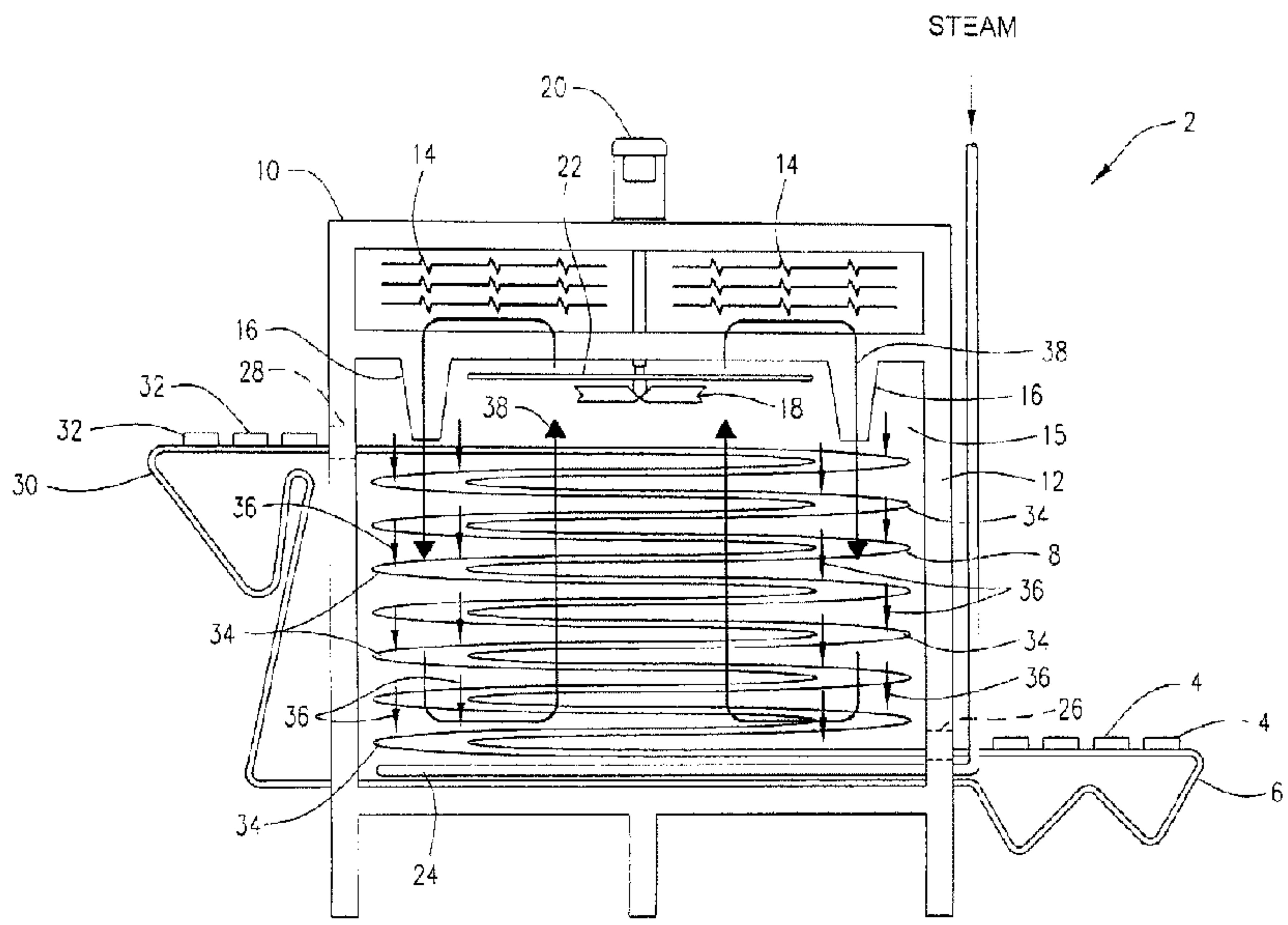

(57) Abrégé/Abstract:
A continuous fire suppression system includes a fire suppressing vapor cooking medium circulating within a cooking chamber of a spiral oven; a temperature analyzer arranged to monitor a temperature of the fire suppressing vapor cooking medium; finned heating elements in communication with the temperature analyzer and arranged to heat the fire suppressing vapor cooking medium; a humidity analyzer arranged to monitor a relative humidity of the fire suppressing vapor cooking vapor medium; and a fire suppressing vapor cooking medium injector in communication with the humidity analyzers. the at least one fire suppressing vapor cooking medium injector arranged to inject the fire suppressing vapor cooking medium into the cooking chamber as needed to maintain a relative humidity equal to or greater than a relative humidity of no more than 10% vol. dry air with the remaining volume being the fire suppressing vapor cooking medium.

ABSTRACT

A continuous fire suppression system includes a fire suppressing vapor cooking medium circulating within a cooking chamber of a spiral oven; a temperature analyzer arranged to monitor a temperature of the fire suppressing vapor cooking medium; finned heating elements in communication with the temperature analyzer and arranged to heat the fire suppressing vapor cooking medium; a humidity analyzer arranged to monitor a relative humidity of the fire suppressing vapor cooking vapor medium; and a fire suppressing vapor cooking medium injector in communication with the humidity analyzers. the at least one fire suppressing vapor cooking medium injector arranged to inject the fire suppressing vapor cooking medium into the cooking chamber as needed to maintain a relative humidity equal to or greater than a relative humidity of no more than 10% vol. dry air with the remaining volume being the fire suppressing vapor cooking medium.

CONTINUOUS GREASE FIRE SUPPRESSION SYSTEM

This is a divisional of Canadian Patent Application No. 2,711,889, filed November 3, 2008.

FIELD OF THE INVENTION

The present invention relates to processes for continuously cooking bacon slices to produce precooked bacon strips and other precooked sliced bacon products.

BACKGROUND OF THE INVENTION

Because of their thinness, the short cooking time required, and the high fat and water content of the raw product, bacon slices are among the most difficult products to cook consistently. The continuous bacon cooking processes heretofore used in the industry have not been able to provide precooked sliced bacon products having the same texture, bite, mouth feel, color, and appearance as pan-fried products cooked in the home. Thus, a need presently exists for a significantly improved continuous process and system capable of producing such precooked sliced bacon products. A need particularly exists for a process of this type which (a) will provide a production rate similar to the microwave processing systems currently used in the art, (b) will take up less floor space in the processing facility, and (c) will eliminate or at least greatly reduce the fire risk posed by other systems.

Heretofore, in the United States, precooked sliced bacon products have been predominantly produced using continuous microwave oven systems. Such microwave cooking processes have typically involved the steps of (a) preconditioning belly, shoulder, or back bacon or a formed bacon log to a temperature in the range of from about -4° to about 5°C; (b) passing the preconditioned bacon through a Grote Slicer or similar slicing device; and then (c) conveying the sliced bacon through a continuous microwave oven. As will be understood by those in the art, the Grote Slicer is typically positioned to place the bacon slices directly on the oven conveyor as they are cut.

Unfortunately, the continuous microwave processes heretofore used for producing precooked sliced bacon products have significant shortcomings and disadvantages. For one thing, there are significant organaleptic differences between the product produced by a continuous microwave process versus a traditional home-fried product. This is due in large part to the fact that the microwave energy has a

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more pronounced effect on the fat and water components of the bacon than on other parts. Thus, the microwave product has a significantly different texture, mouth feel, bite, appearance, and color. In addition, continuous microwave oven systems can be as much as 70 feet or more in length and, thus, take up a great deal of space in the processing facility.

As an alternative to continuous microwave cooking, precooked sliced bacon products have also been produced using continuous linear circulating air oven systems. Unfortunately, however, the products produced in the linear circulating air oven systems have been even less crisp and lighter in color than the microwave products. In addition, the linear circulating air systems have had a tendency to burn or blacken the edges of the bacon slices and have also required an even greater amount of floor space to achieve throughputs approaching those of the microwave systems. Further, because of the large amount of hot, flammable grease produced when cooking bacon, the fire risk presented by a circulating air oven is very high.

In addition, as will also be understood by those in the art, the general trend in the meat industry for achieving improvements in circulating air cooking processes has been toward the use of increasingly higher flow circulation rates and impingement velocities. Unfortunately, however, the application of high velocity impingement air to the rather delicate, thinly sliced bacon product traveling through the oven causes the product to be displaced on (i.e., to be moved on or blown off of) the oven conveyor belt. Also, linear impingement oven systems would still take up a relatively large amount of space in the processing facility and would present an even greater fire risk for bacon cooking.

SUMMARY OF THE INVENTION

The present invention provides a spiral oven process for preparing precooked sliced bacon products which unexpectedly and surprisingly satisfies the needs and alleviates the problems discussed above. The inventive spiral oven process and system can produce a precooked sliced bacon product of generally any desired crispness and generally any desired color ranging from light gold to very dark golden brown. The inventive system also has a very small footprint and eliminates or at least greatly reduces the fire risk posed by the prior art circulating air oven systems.

Moreover, the inventive bacon cooking process will produce a consistent product which does not have burned or blackened outer edges and is much closer than a microwaved product to home-fried bacon.

In one aspect, there is provided a process for continuously cooking bacon comprising the steps of: (a) placing bacon slices on a conveyor of a spiral oven such that the conveyor carries the bacon slices through the spiral oven in a spiral pattern, the spiral oven having at least one opening (e.g., for the conveyor) which is open to atmospheric conditions outside of the spiral oven; (b) indirectly cooking the bacon slices in the spiral oven by contacting the bacon slices with a cooking medium circulating in the spiral oven at an average contacting temperature of at least 325°F and at a contact flow velocity which is sufficiently low that the bacon slices will not be displaced on the conveyor when contacted by the cooking medium; and (c) adding steam to the cooking medium in a manner effective to maintain the cooking medium during step (b) such that a partial pressure of air which would otherwise be present in the cooking medium without adding the steam in step (c) is reduced by at least 10%.

In another aspect, there is provided a process for continuously cooking bacon comprising the steps of: (a) placing bacon slices on a conveyor of a spiral oven such that the conveyor carries the bacon slices upwardly in the spiral oven in a spiral pattern, the spiral oven having an inlet opening and an outlet opening for the conveyor wherein the inlet and outlet openings are open to atmospheric conditions outside of the spiral oven; (b) indirectly cooking the bacon slices in the spiral oven by contacting the bacon slices for a time in the range of from about 3 to about 9 minutes with a cooking medium circulating in the spiral oven at an average contacting temperature in the range of from about 325°F to about 650°F and at a nonimpinging contacting flow velocity which is sufficiently low that the bacon slices will not be displaced on the conveyor when contacted by the cooking medium; and (c) adding steam to the cooking medium in a manner effective to maintain the cooking medium during step (b) such that a partial pressure of air which would otherwise be present in said cooking medium without adding said steam in step (c) is reduced by at least 15%. When initially contacted by the cooking medium in the spiral oven, the bacon slices have a surface temperature which is sufficiently low to cause an amount of water from the cooking medium to initially condense on the bacon slices. In addition, the conveyor is an open conveyor such that fat dripping from those of the bacon slices traveling at higher elevations within the spiral oven will fall onto and baste those of the bacon slices traveling at lower elevations within the spiral oven.

In another aspect, there is provided a process for continuously cooking bacon comprising the steps of: (a) placing bacon slices on a conveyor of a spiral oven such that the conveyor carries said bacon slices upwardly in said spiral oven in a spiral pattern; (b) indirectly cooking the bacon slices in the spiral oven by contacting the bacon slices with a cooking medium circulating in the spiral oven at an average contacting temperature of at least 325°F and at a contacting flow velocity which is sufficiently low that the bacon slices will not be displaced on the conveyor when contacted by the cooking medium; (c) monitoring the cooking medium during step (b) using an analyzer of a type used for determining a relative humidity or dew point of air and for providing analyzer result readings on a relative humidity percentage scale or other corresponding result scale; and (d) adding steam to the cooking medium in a manner effective to cause an analyzer result reading of or corresponding to a value of at least 10% on the relative humidity percentage scale to be maintained for the cooking medium during step (b).

In yet another aspect of the invention, there is provided a continuous fire suppression system comprising: a spiral oven including a cooking chamber and a spiral conveyor; a basting drippage in the cooking chamber which falls downwardly through the spiral conveyor; a vapor cooking medium circulating within the spiral cooking chamber which suppresses combustion of the basting drippage; a temperature controller arranged to monitor and control a temperature of the vapor cooking medium in the cooking chamber; at least one heating element in communication with the temperature controller and arranged to heat the vapor cooking medium; an analyzer arranged to monitor a targeted condition in the cooking chamber wherein, in the targeted condition, an amount of air present in the cooking chamber is from 0% to 10% vol, the remainder volume being the vapor cooking medium; and a vapor cooking medium injector system arranged to inject an additional amount of the vapor cooking medium into the cooking chamber as needed to maintain the targeted condition.

Further aspects, features, and advantages of the present invention will be apparent to those or ordinary skill in the art upon examining the accompanying drawings and upon reading the following detailed description of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 schematically illustrates an embodiment of the inventive spiral oven process for continuously cooking bacon slices.

FIG. 2 schematically illustrates an embodiment of a method for monitoring and controlling one or more conditions of the cooking chamber.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment 2 of the inventive spiral oven process for continuously cooking bacon slices is illustrated in the accompanying drawing. In the inventive process 2, raw bacon slices 4 are placed on the infeed section 6 of the continuous conveyor belt 8 of a spiral oven 10. The raw bacon slices 4 are preferably laid directly on the conveyor infeed section 6 as they are cut from a bacon source (e.g., belly,

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shoulder, or back bacon, a formed bacon log, or other source) by a Grote Slicer or similar slicing device.

The spiral oven **10** used in the inventive process **2** preferably comprises: an oven housing **12** having a cooking chamber **15**; a plurality of heating elements **14** positioned in the upper portion of the housing **12** above the cooking chamber **15**; a plurality of air flow cones or nozzles **16** provided in the upper portion of the housing below the heating elements **14** for delivering the heated cooking medium into the cooking chamber **15**; a circulation fan **18** provided in the housing **12** below the heating elements **14**; an exterior fan motor **20**; an upper steam injection ring **22** positioned between the circulation fan **18** and the heating elements **14**; an optional lower steam injection ring **24** provided in the bottom of the combustion chamber **15**; a conveyor inlet opening **26** located at an elevation near the bottom of the cooking chamber **15**; a conveyor outlet opening **28** located at an elevational near the top of the cooking chamber **15** beneath the air flow cones or nozzles **16**; and a conveyor outlet section **30** which delivers the cooked sliced product **32** from the outlet **28** of the spiral oven **10**.

As is typical in spiral ovens, the conveyor belt **8** continuously conveys the bacon slices **4** upwardly in the cooking chamber **15** in a spiral pattern as illustrated in the drawing. The belt **8** is preferably an open mesh belt (commercially available from Ashworth Brothers, Cambridge International, and other manufacturers) or other type of open belt such that, as illustrated by basting drippage arrows **36,** the fat which drips from the products **4** traveling along the spiral flites **34** at succeedingly higher elevations within the oven housing **12** will fall onto and baste the bacon slices **4** traveling along the flites **34** at lower elevations. At the same time, the cooking medium circulation fan **18** circulates the hot cooking medium within the oven housing **12** in a flow pattern **38** such that the fan **18** draws the cooking medium upwardly from the cooking chamber **15** and blows the cooking medium through the upper heating elements **14** and then downwardly via the air flow cones or nozzles **16** back into the cooking chamber **15**.

The raw bacon slices **4** placed on the conveyor infeed section **6** can be of any desired type, size, thickness, or shape. The slices **4** will typically be in the form of common breakfast strips which are approximately two inches wide, approximately 10-

12 inches long, and from about 1 to about 5 mm thick. Wider slices can be provided, for example, by bonding two bellies together prior to slicing. The thickness of the bacon slices **4** will typically be in the range of from about 1.2 to about 3.5 mm and will more typically be in the range of from about 1.6 to about 3 mm. As mentioned above, because of their relative thinness and the short cooking time required, bacon slices are among the most difficult products to cook consistently.

In accordance with the inventive process **2**, the bacon slices **4** are indirectly cooked as they travel upwardly through the cooking chamber **15** of the spiral oven **10** by contacting the bacon slices with the heated cooking medium which is circulated through the oven. In addition, another novel and unexpectedly beneficial aspect of the inventive bacon cooking process is that the cooking medium will preferably be a high enthalpy, superheated vapor medium comprised of at least a high level of water vapor.

The high water vapor content of the cooking medium within the spiral oven **10** will preferably be produced and maintained by injecting steam into the oven **10** as needed via the upper steam injection ring **22**. Alternatively, or in addition, steam can be injected into the oven **10** via the steam injection ring **24** within the bottom of the cooking chamber **15**. The steam can be saturated steam or superheated steam and will preferably be superheated steam under pressure. The steam used in the inventive process will preferably be superheated steam provided to the inventive cooking system at a pressure of about 40 psig and a temperature of at least 265°F.

The amount of steam used in the inventive process will be an amount effective to reduce the partial pressure of or substantially eliminate the air which would otherwise be present in the "natural" cooking environment if no steam were injected into the spiral oven **10**. Without steam injection, the "natural" cooking environment would be comprised of (a) air, (b) volatile organics resulting from the bacon cooking process, and (c) an amount of water vapor derived from the water content of the raw bacon slices **4** and from the atmospheric humidity of the air. As will be understood by those in the art, some additional water content in the "natural" cooking medium environment can also be derived from any moisture which happens to remain on the conveyor belt **8** as a result of the continuous external belt cleaning process used during oven operation.

The reduction of air partial pressure and/or air content in the otherwise natural cooking environment results from the injection of steam and can also further result from the creation of a positive pressure condition with the oven 10. Depending, for example, on the size of the belt inlet and outlet openings 26 and 28 and upon the existence of any other openings, the injection of a sufficient amount of steam into the spiral oven 10 can, and preferably will, create a sufficient positive pressure condition in the oven 10 to substantially prevent outside air from entering the oven openings during operation. Moreover, the design of the spiral oven 10 and the amount of steam injection can be sufficient to create enough of an internal positive pressure condition to cause some of the internal vapor to flow out of oven openings, thus resulting in a steady state condition wherein substantially all of the air has been removed and replaced with steam.

The amount of steam injected into the spiral oven 10 in the inventive bacon cooking process will preferably be an amount sufficient to reduce the partial pressure of air which would otherwise be present in the "natural" cooking environment by at least 10%. The amount of steam injected into the spiral oven 10 will more preferably be an amount sufficient to reduce the partial pressure of air which would otherwise be present by at least 15%, at least 20%, at least 30%, at least 40%, at least 50%, at least 60%, at least 70%, at least 80%, or at least 90%. The amount of steam injected into the spiral oven 10 will most preferably be an amount sufficient to replace substantially all of the air which would otherwise be present in the "natural" cooking environment.

In another surprising and unexpected aspect of the present invention, it has been discovered that an extremely effective method for monitoring and controlling 50 the injection of steam into the spiral oven 10 to target and achieve any desired sliced bacon product characteristics is to use a Vaisala dry cup dew point analyzer or other relative humidity and/or dew point monitoring device 52. The unexpected success obtained through the use of an instrument of this type for targeting and achieving substantially any desired product result in the present invention is particularly surprising in view of the fact that the concept of "relative humidity" above the intended operational limit of such instruments (i.e., the boiling point of water) is, at best, ambiguous. Even more surprising is the discovery that the resulting purported "percentage" or other equivalent readings indicated on the relative humidity percentage scales or corresponding scales (e.g., "dew point temperature") of such instruments can be used in the inventive process to successfully control steam injection rates for achieving specific product results even though, in many and perhaps even most cases, most or all of the air in the oven 10 will actually have been replaced with superheated steam.

The sensor for the Vaisala dry cup dew point transmitter or other device can be placed at generally any desired location within the spiral oven 10. Although readings can be monitored at any desired location or at a plurality of points within the spiral oven 10, the analyzer readings for the cooking medium will preferably be taken close to the actual cooking point, most preferably at a midpoint elevation in the cooking chamber 15 and as close to the product as is reasonably feasible.

When using a Vaisala dry cup analyzer or similar instrument in the inventive process, the rate of steam addition to the spiral oven 10 will preferably be controlled to maintain a targeted analyzer reading in the range of from at least 10% to 100%. In most cases, a targeted instrument reading in the range of from about 15% to about 90%, more preferably from about 20% to about 85%, will be used to control the rate of steam injection to obtain the particular product characteristics desired. Once again, this control method has been found to be very effective for use in the inventive process even though the instrument may not actually be, and likely is not, measuring a true "relative humidity" of the heated cooking medium.

Depending upon the desired operating ranges (e.g., the temperature range used and whether the environment is substantially oxygen free or contains oxygen) and other factors, it will be understood that temperature or oxygen analyzers 54 or other types of instruments could be used to monitor and maintain targeted conditions within the spiral oven 10 in at least some cases.

In further contrast to the industry trend toward using higher flow velocities, even in spiral ovens, the inventive process also unexpectedly provides surprising bacon cooking benefits by circulating the cooking medium within the spiral oven in a more gentle, convective, nonimpinging manner such that the cooking medium contacts the bacon slices 4 at a flow velocity which is sufficiently low to prevent the bacon slices 4 from being displaced on (i.e., to prevent the bacon slices 4 from being moved on or blown off of) the conveyor belt **8**.

The contacting flow velocity within different regions of the cooking chamber **15** could vary depending upon the degree of doneness of the product at any given point. Although some heavier raw bacon products entering the cooking chamber **15** could be contacted at a low flow velocity of as much as 42 feet per second without displacing the product on the belt **8**, the flow velocity, at least in the upper region of the cooking chamber **15**, will preferably be lower in order not to displace the lighter, cooked bacon product. Consequently, the circulation rate within at least the upper region of the cooking chamber **15** will preferably be sufficiently low that the cooking medium will contact the bacon slices **4** at a flow velocity of not greater than 20 feet per second. The contacting velocity in at least the upper portion of the cooking chamber **15** will more preferably not be greater than 10 feet per second and will most preferably be only about 5.5 feet per second.

Spiral ovens adaptable for use in the inventive bacon cooking process are commercially available, for example, from Unitherm, Stein, Heat & Control, and C.F.S. The oven **10** will most preferably be a Unitherm Electric Spiral Oven. Although such spiral ovens are typically operated in other processes at much higher circulation rates, the spiral oven **10** will preferably be operated at a much lower circulation rate in the inventive process **2**, as already mentioned, in order to provide a more gentle, convective flow over the product. The fan speed of the Unitherm Electric Spiral Oven, for example, will preferably be reduced to provide a circulation rate of not more than 500 cubic feet per minute (CFM) within the oven **10**.

The temperature and cooking time (i.e., belt speed) within the spiral oven **10** can be varied as desired to obtain generally any desired degree of crispness and generally any desired color ranging from light gold to dark golden brown. The average temperature of the cooking medium within the cooking chamber **15** will preferably be in the range of from about 325°F to about 650°F or higher. Depending upon the degree of crispness and brownness required, the residence time of the product **4** within the spiral oven cooking chamber **15** will typically be in the range of from about 3 to about 9 minutes.

In a preferred "high temperature" embodiment of the inventive method, the average temperature of the cooking medium will preferably be at least 375°F. The average temperature of the cooking medium within the cooking chamber **15** in the "high temperature" embodiment will more preferably be controlled in the range of from about 385° to 550°F and will most preferably be about 425°F. The residence/cooking time of the product within the spiral oven cooking chamber **15** in the "high temperature" embodiment will preferably be in the range of from about 3 to about 7 minutes and will most preferably be in the range of from about 4 to about 6 minutes. In addition, if a Vaisala dry cup analyzer or similar device is used to monitor the cooking medium within the cooking chamber **15**, the amount of steam injected into the spiral oven **10** in the "high temperature" embodiment will preferably be controlled to maintain an analyzer reading which is or is equivalent to a value in the range of from about 15% to about 45%, most preferably in the range of from about 20% to about 35%, on the purported "relative humidity" percentage scale of the Vaisala analyzer.

In an alternative "low temperature" embodiment, the average cooking medium temperature will preferably be in the range of from about 325°F to about 385°F (most preferably about 350°F), the analyzer reading for the cooking medium will preferably be maintained in the range of from about 45% to about 85% (most preferably about 75%), and the cooking time will preferably be in the range of from about 6.5 to about 9 minutes (most preferably about 8 minutes). The "low temperature" embodiment eliminates smoke and provides a product with little or no pit flavor notes.

The heating elements **14** employed in the spiral oven **10** can be thermal oil elements, steam elements, electric elements, or any other type of element capable of heating the circulating cooking medium within the oven **10** to the temperature desired. Because of the relatively high cooking temperatures typically preferred in the inventive process **2** and in order to provide a broad range of possible temperatures and results, the heating elements **14** will preferably be finned electrical heating elements capable of heating the circulating cooking medium to a cooking temperature of 650°F or higher. In addition, to ensure that a highly consistent cooked product **32** is obtained and that none of the cooked product **32** is either undercooked or overcooked, those in the art will understand that the electrical heating elements **14** used in the spiral oven **10** will preferably be tightly controlled at the desired set point using a thyristor or similar device.

Because there is no need for the flow of makeup air into the spiral oven **10** when employed in the inventive indirect cooking process **2**, the inlet opening **26** and the outlet opening **28** for the conveyor **8** can each be "choked" in order to (a) minimize the energy losses from the oven **10** to the atmosphere, (b) further stabilize the cooking conditions therein, and (c) assist in establishing something of a positive pressure condition in the spiral oven **10**, when desired. Each of the inlet and outlet openings **26** and **28** will preferably be only slightly wider than the oven belt **8** and will preferably be sufficiently limited in height to provide not more than a 10 mm clearance, most preferably not more than a 6 mm clearance, above the belt **8**.

The high moisture content of the cooking medium, combined with the relatively high temperature within the oven **10**, the gentle convective flow therein, and the natural basting provided by the upward spiral path of the product through the oven **10**, unexpectedly and surprisingly provides unique benefits and advantages which have not been provided by the circulating air systems and other systems heretofore tried for cooking bacon slices. Even more surprisingly, these features of the inventive process unexpectedly combine to yield a cooked sliced bacon product **32** which has much more of a pan-fried texture, bite, mouth feel, appearance, and color than the previously preferred products produced using continuous microwave systems. The high moisture, high enthalpy cooking medium employed in the inventive spiral oven process **2** also facilitates heat transfer into the sliced bacon product **4** and greatly reduces or eliminates the fire risk posed by the prior circulating air cooking systems.

Moreover, the high water vapor content used and the other characteristics of the inventive spiral oven process **2** operate to enhance the browning process and protect the product during cooking so that much more of a pan-fried color and a pan-fried crispness are obtained without burning or blackening the edges of the product. The bacon product is preferably preconditioned prior to delivery to the slicer such that the bacon slices **4** deposited on the oven conveyor belt **8** will have a low surface temperature, typically in the range of from about -6° to about 5°C. Because of the low initial surface temperature of the raw bacon slices **4** and because of the high superheated water vapor content within the spiral oven **2**, a small amount of water from the cooking medium initially condenses on the surface of the product **4**, typically in micro droplet form, as the product enters the oven **10**. The condensate which initially forms on the product surface heats rapidly, but it does so in conjunction with the fat on the product surface which unexpectedly allows the fat to boil and to color the outer edges of the product without burning. Then, combined with the unexpected benefit provided by the initial surface condensation effect, the fat drippage basting regime within the oven **10** from each spiral flight **34** to the next further operates to develop the color, crispness, and bite desired.

In addition, in an alternative embodiment of the inventive method, the raw bacon slices **4** can optionally be pretreated prior to entering the spiral oven cooking chamber **15** by contacting the raw slices **4** with dry (i.e., superheated) steam. The pretreating steam temperature will preferably be about 250°F. The optional steam pretreatment begins the moisture crusting process and assists in producing a flatter sliced product.

Example

A Grote Slicer is used to cut bacon slices directly onto the conveyor infeed section **6** of a Unitherm Electric Spiral Oven **10** of the type illustrated in the drawing. The bacon slices are each two inches wide, 10 inches in length, and have a thickness of about 3 mm. The bacon slices have an initial surface temperature of -6°C. The belt **8** of the spiral oven **2** is an open wire mesh belt which is 36 inches wide and which receives and conveys the raw bacon slices in a three lane arrangement across the belt at a total rate of 900 raw slices per minute. This is equivalent to a total feed rate of 5400 pounds per hour of raw sliced bacon.

The oven **10** utilizes finned electrical elements **14** which are operated to provide an average cooking medium temperature within the cooking chamber **15** of 425°F. The cooking medium within the oven cooking chamber **15** is monitored using a Vaisala dry cup dew point analyzer. An analyzer value of 24% for the cooking medium is maintained by the injection of 40 psig superheated steam at about 268°F. The injection of steam produces a positive pressure condition within the spiral oven **10** which is slightly above atmospheric pressure. The speed of the spiral conveyor **8** is set to provide a cooking time of 5.5 minutes. The oven fan speed is set to provide a cooking medium circulation rate within the oven **10** of 300 cubic feet per minute.

The resulting cooked product has a crispness, appearance, and degree of golden brown color which are substantially the same as a bacon product which has been pan fried at 500°F for 5 minutes (i.e., 2.5 minutes per side).

* * * *

Thus, the present invention is well adapted to carry out the objectives and attain the ends and advantages mentioned above as well as those inherent therein. While presently preferred embodiments have been described for purposes of this disclosure, numerous changes and modifications will be apparent to those of ordinary skill in the art. Such changes and modifications are encompassed within this invention as defined by the claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A continuous fire suppression system comprising:

a spiral oven including a cooking chamber and a spiral conveyor;

a basting drippage in the cooking chamber which falls downwardly through the spiral conveyor;

a vapor cooking medium circulating within the spiral cooking chamber which suppresses combustion of the basting drippage;

a temperature controller arranged to monitor and control a temperature of the vapor cooking medium in the cooking chamber;

at least one heating element in communication with the temperature controller and arranged to heat the vapor cooking medium;

an analyzer arranged to monitor a targeted condition in the cooking chamber wherein, in the targeted condition, an amount of air present in the cooking chamber is from 0% to 10% vol, the remainder volume being the vapor cooking medium;

a vapor cooking medium injector system arranged to inject an additional amount of the vapor cooking medium into the cooking chamber as needed to maintain the targeted condition.

2. A continuous fire suppression system according to claim 1 further comprising the vapor cooking medium including superheated steam.

3. A continuous fire suppression system according to claim 1 wherein the basting drippage includes bacon fat.

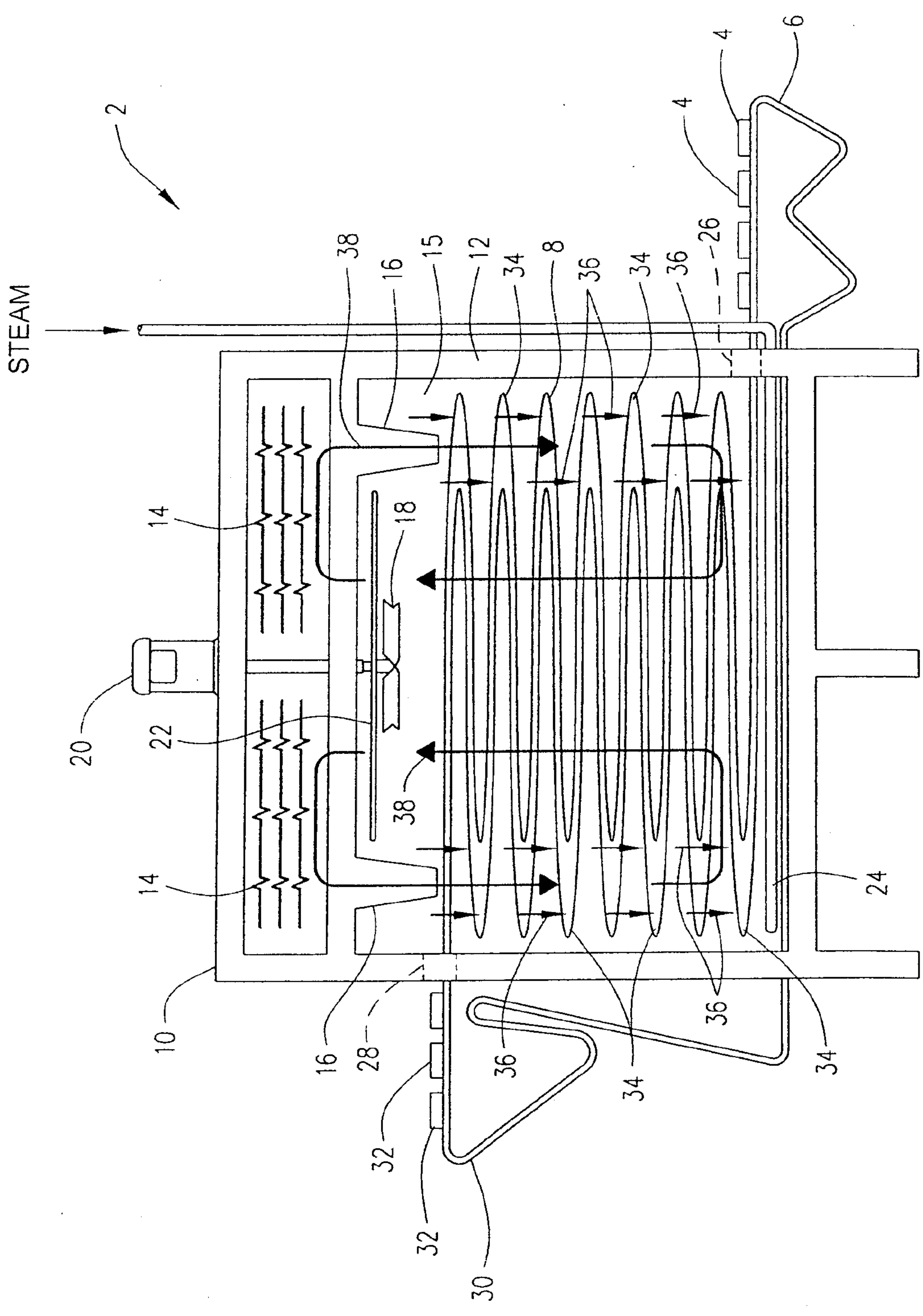
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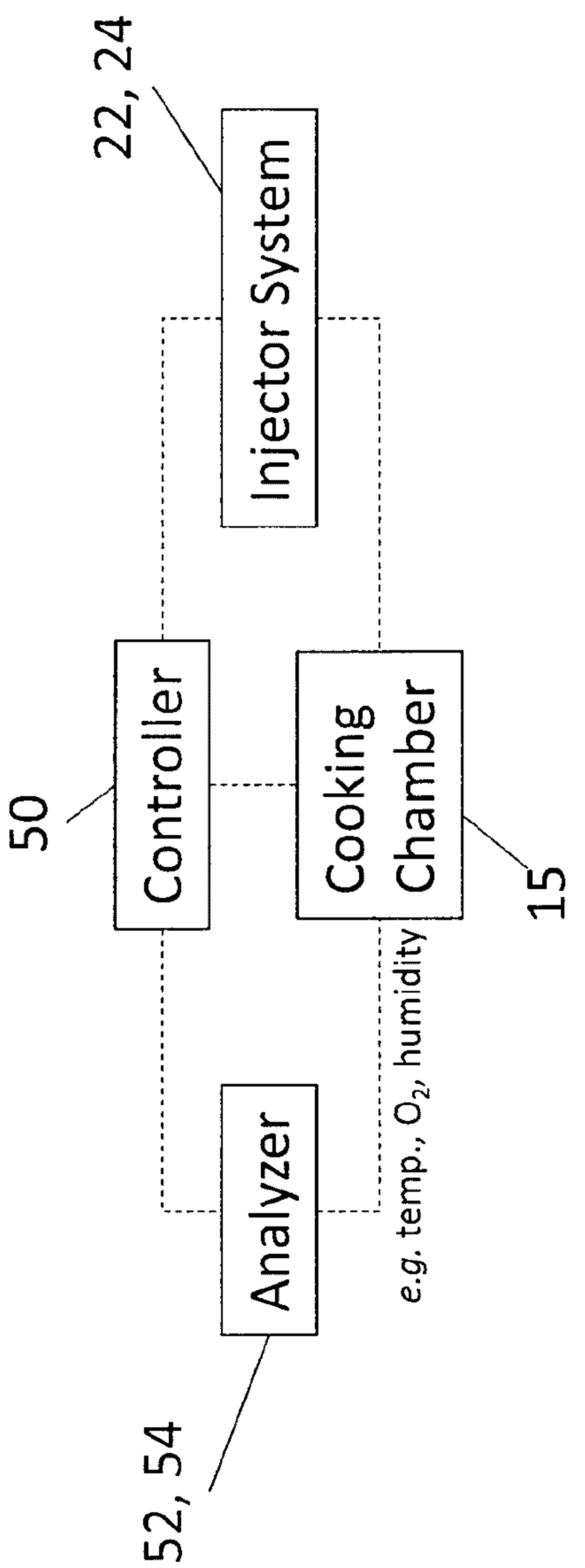
Fig. 1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Controller
Cooking
Chamber
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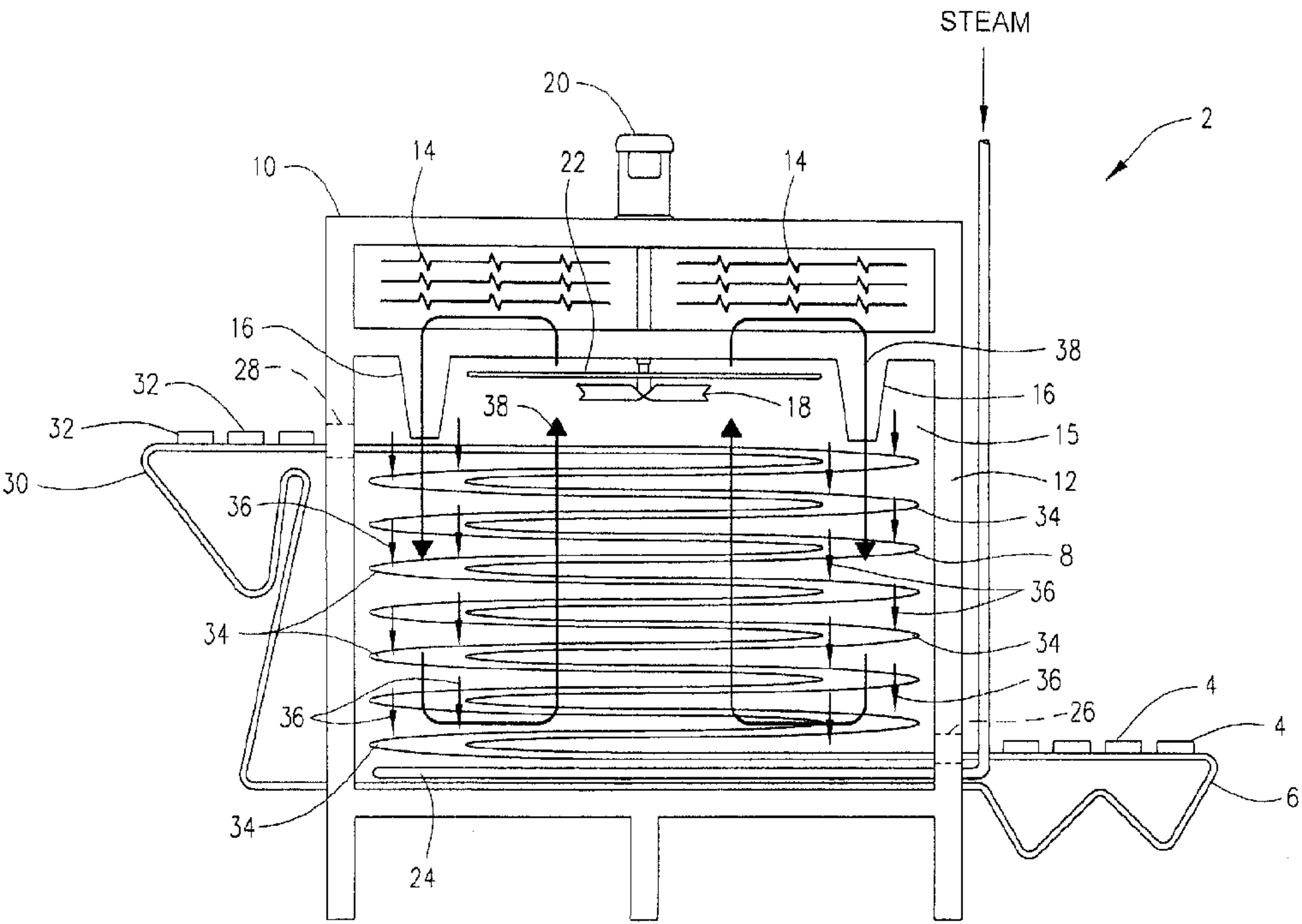
Analyzer
e.g. temp., O_2, humidity
52, 54

Fig. 2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