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- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

- with international search report (Art. 21(3))
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(54) Title: LOW-TEMPERATURE STEAM-COOKING OF CHICKEN PARTS

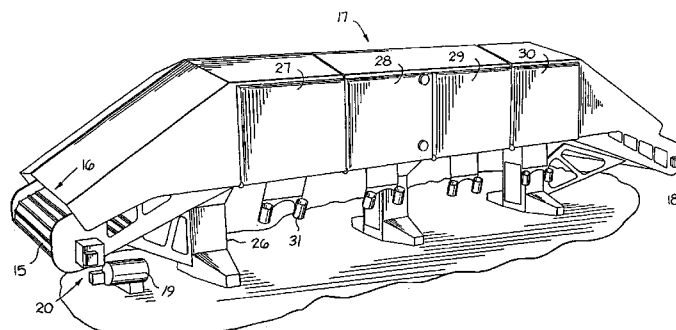


FIG. 1

(57) Abstract: A method for steam-cooking chicken parts at reduced temperatures below about 85°C to decrease the loss of chicken by weight during the cooking process. An exemplary apparatus for carrying out the method of the invention includes a forced-convection steam cooker with a foraminous conveyor belt continuously transporting chicken parts into and through a cooking chamber open to the atmosphere. Thermostatic controls allow the temperature of the cooking chamber to be adjusted for the proper cooking time. The cooking chamber contains a substantially homogeneous gaseous environment of a steam mixture for even cooking. The gaseous cooking fluid is forced through the foraminous belt and around the conveyed chicken parts. After being cooked in the cooking chamber, the chicken parts are ready for battering and frying.

LOW-TEMPERATURE STEAM-COOKING OF CHICKEN PARTS

BACKGROUND

The invention relates to steam cooking and, more particularly, to methods for steam cooking chicken parts at reduced temperatures to decrease yield loss.

5 In the bulk processing of chicken parts, sometimes the parts are precooked in water baths or steam environments before battering and frying. In continuous cookers that are open to the atmosphere and operate at atmospheric pressure, the chicken parts are cooked with steam or steam-air mixtures at 212°F (100°C).

The loss of weight in the final cooked product is costly to the chicken processor. Any
10 decrease in weight loss directly benefits the processor. Consequently, methods that decrease the weight loss in chicken parts would be pleasing to the chicken-processing industry.

One object of the invention is to increase the yield of cooked chicken parts through a cooking process that decreases the loss of weight during cooking.

SUMMARY

15 These objectives and others are accomplished by the invention, which provides a method for cooking raw chicken parts. The method comprises: (a) conveying raw chicken parts through a cooking chamber on a foraminous conveyor belt; (b) forcing a substantially homogeneous gaseous atmosphere comprising a steam mixture through the foraminous belt and past the chicken parts in the cooking chamber; (c) controlling the temperature of the
20 gaseous atmosphere in the cooking chamber to a cooking temperature of about 85°C or less; and (d) controlling the dwell time of the chicken parts in the cooking chamber as a function of the cooking temperature.

DRAWINGS

These and other aspects, advantages, and features of the invention will become more
25 apparent by reference to the following description, appended claims, and accompanying drawings in which:

FIG. 1 is a perspective view of a steam cooker capable of being used according to the method of the invention;

FIG. 2 is a cut away view looking into the interior of the cooker of FIG. 1; and

FIG. 3 is a system block diagram systematically illustrating cooker control features associated with the cooker of FIG. 1.

DETAILED DESCRIPTION

FIGS. 1 and 2 show an example of one cooking apparatus capable of performing the method of the invention. As seen from FIG. 1, a product to be cooked, such as raw chicken parts, is loaded on a conveyor belt 15 at an entrance port 16 for transport through a cooker cabinet 17 toward an exit port 18. The cooking chamber inside the cooker cabinet is open to the atmosphere through the two ports. No seals are needed. A drive motor 19 and belt speed control system 20 is provided for varying the dwell time of the chicken parts on the belt in the cooker as a cooking control feature. Thus, as required for cooking chicken parts of different sizes or different loading densities on the belt, a desired cooking dwell time can be established by controlling belt speed. Lower cooking temperatures typically require longer dwell times. The belt permits the continuous transport of chicken parts through the cooker without interruption of product flow. Support legs 26 include leveling adjustments. Doors 27-30 are moved downwardly against brackets 31 for access into the internal cooking region for easy access to the inside of the cooker.

A lower portion of the internal cooking region is shown in FIG. 2 looking toward the belt entrance port 16 without the belt in place. Disposed in an upper cooking zone is an interconnected manifold or set of steam inlet pipes 95 dispersed along the cooking chamber for introducing cooking gases, such as steam or a steam mixture that could include air or a non-reactive gas such as nitrogen, carbon dioxide, or helium. Multiple outlet holes or slits 36 in steam pipe 95 release steam into the cooking chamber to cook the product on the belt 15, which rides just above the steam inlet pipes. A thermostat sensor 50 is positioned in the lower part of the cooking chamber and is coupled to a steam control system 50B controlling a flow control valve 50A that passes steam from a steam source 58 into the cooking chamber, as shown schematically in FIG. 3. A steam line 40 passes into the cooker through an opening 41 in the bottom 38 of the cooking chamber. The steam line is connected to the inlet pipes 95. The bottom of the chamber is sloped to funnel condensate to a drain or water treatment or recovery system.

The control system is adjusted to let in just enough steam to maintain a predetermined temperature at the thermostat. If the temperature is set high enough, the

cooking chamber will be filled with a pure steam environment at 100°C, unless convection is enabled by fans 55 or other means for mixing air with the steam and providing a substantially homogeneous steam-air mixture for even cooking. Merely lowering the thermostat setting will ensure that air is drawn into the cooking region through the entrance and exit ports to mix with the steam. Thus, we are suggesting that natural or forced convection or other means for intentionally mixing air with steam into a homogeneous cooking environment to lower the cooking temperature be used. The temperature at the thermostat is known as a function of the temperature in the product cooking region of the chamber. It would alternatively be possible to position the thermostat closer to the cooking region for a direct indication of cooking temperature.

An optional source of cooking gases is shown in the dashed-line box of FIG. 3 by a source 52 of air or a non-reactive gas, such as nitrogen, carbon dioxide, or helium. Non-reactive gases such as these do not react substantially with the chicken product and may also have better heat transfer characteristics than air to reduce cooking time. A control valve 53 allows the air or non-reactive gas to be mixed with the steam in a steam line 44. The control 50B can premix the steam and air or non-reactive gas in predetermined proportions and at a predetermined temperature and injection rate depending on product size and density.

The method of cooking chicken parts at temperatures below 212°F (100°C) was arrived at based on trials performed to test the hypothesis that low-temperature steam cooking would produce higher yields than conventional high-temperature steam cooking or even water cooking. Cooking trials were performed on a LAITRAM® CoolSteam™ forced-convection steam cooker. Chicken parts, specifically, drummettes, were conveyed through the cooker on a foraminous conveyor belt. The cooker operated at atmospheric pressure. Upon entry into the cooker, all the drummettes had core temperatures of about 50°F (10°C). The drummettes were conveyed through the cooker with a steam-air mixture forced vertically through the foraminous conveyor belt and past the drummettes. TABLE 1 shows the results for the various cooking combinations. Because the cooker does not cook at 100°C, cooking was performed at 98°C to represent high cooking temperatures (Tests 1–3, above the thick line in the table). The lower cooking temperatures, between 75°C and 85°C, provided better yields (the ratio of cooked weight to raw weight), as shown by Tests 4–24 below the dark line. The average yield for low-temperature cooking was 88.5% compared to 86.3% for high-temperature steam cooking of drummettes. This 2% difference in reduced yield loss is

significant. Steam cooking appears to be advantageous relative to product yield. After the chicken parts were cooked in the steam cooker, they were coated in batter and fried in a fryer.

Test #	Raw Weight (grams)	Cook Time (min)	Cooking Temp (°C)	Cooked Weight (grams)	Yield
1	56.5	10:00	98	49	86.73%
2	65	10:00	98	56.5	86.92%
3	58	10:00	98	49.5	85.34%
4	47	12:30	85	42	89.36%
5	46	12:30	85	41.5	90.22%
6	53.5	12:30	85	49	91.59%
7	46	15:00	75	39.5	85.87%
8	62.5	15:00	75	55	88.00%
9	49	15:00	75	46	93.88%
10	45	20:00	75	40.5	90.00%
11	42	20:00	75	38	90.48%
12	57	20:00	75	49	85.96%
13	53	14:00	80	47	88.68%
14	47.5	14:00	80	42	88.42%
15	45.5	14:00	80	41	90.11%
16	57	18:00	80	49.5	86.84%
17	54	18:00	80	48.5	89.81%
18	58	18:00	80	50.5	87.07%
19	55	12:30	85	47.5	86.36%
20	65	12:30	85	58	89.23%
21	44.5	12:30	85	39	87.64%
22	44.5	14:00	85	39.5	88.76%
23	44.5	14:00	85	37	83.15%
24	45.5	14:00	85	40	87.91%

TABLE 1

The test results suggest a departure from the traditional practice of minimizing cook time to the practice of longer steam cooking times in a lower temperature environment.

What is claimed is:

CLAIMS

1. A method for cooking raw chicken parts, comprising:
conveying raw chicken parts through a cooking chamber on a foraminous conveyor belt;
forcing a substantially homogeneous gaseous atmosphere comprising a steam mixture
5 through the foraminous belt and past the chicken parts in the cooking chamber to
cook the chicken parts;
controlling the temperature of the gaseous atmosphere in the cooking chamber to a
cooking temperature of about 85°C or less;
controlling the dwell time of the chicken parts in the cooking chamber as a function of
10 the cooking temperature.
2. A method for cooking as in claim 1 wherein the temperature ranges from about 75°C to
about 85°C.
3. A method for cooking as in claim 1 further comprising battering and frying the chicken
parts after they leave the cooking chamber.

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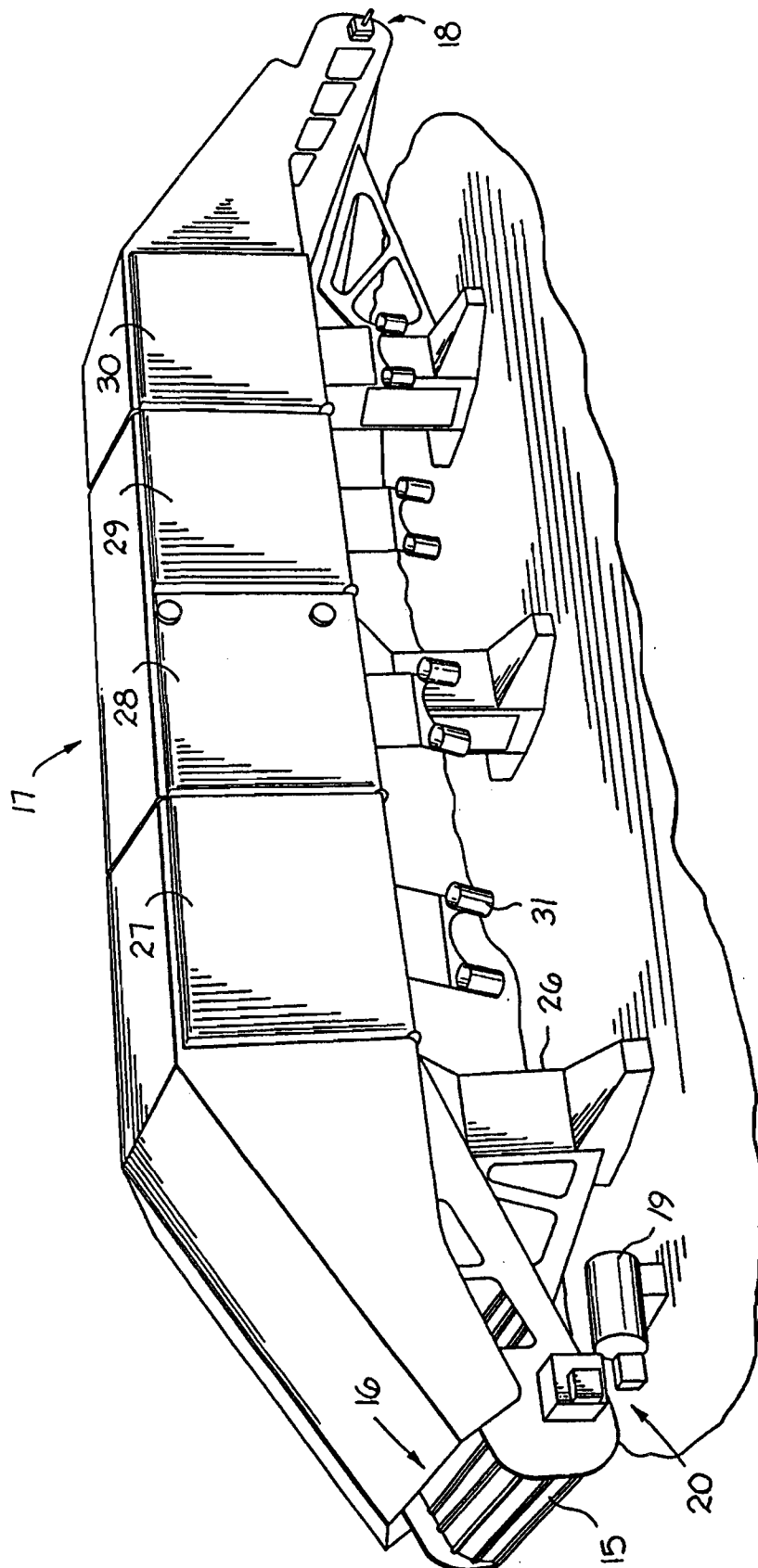


FIG. 1

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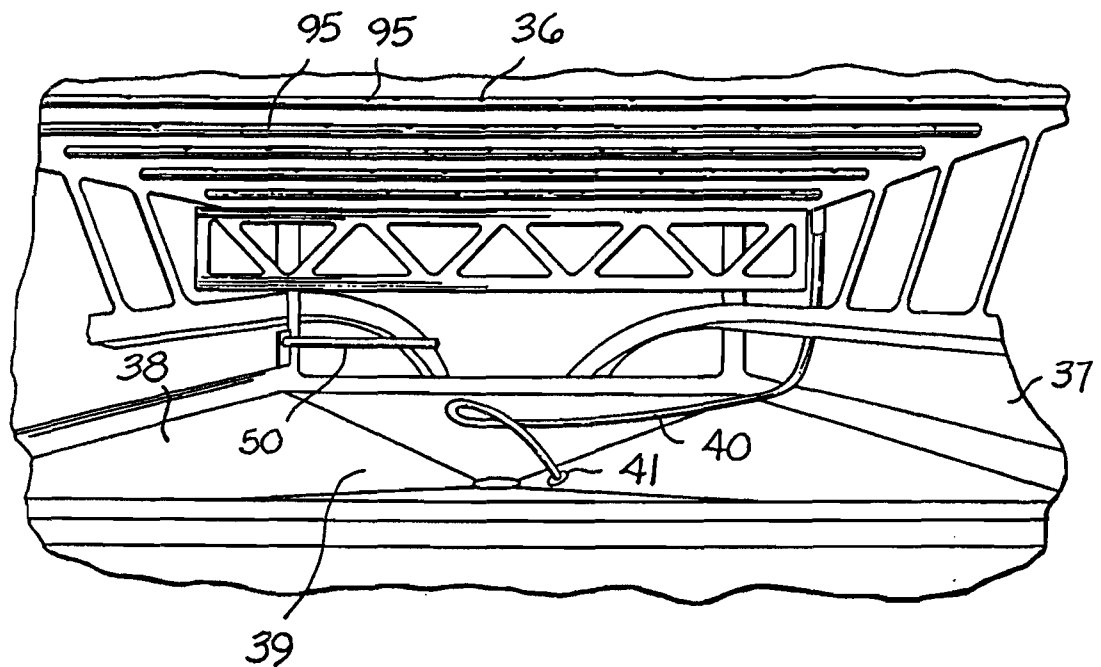


FIG. 2

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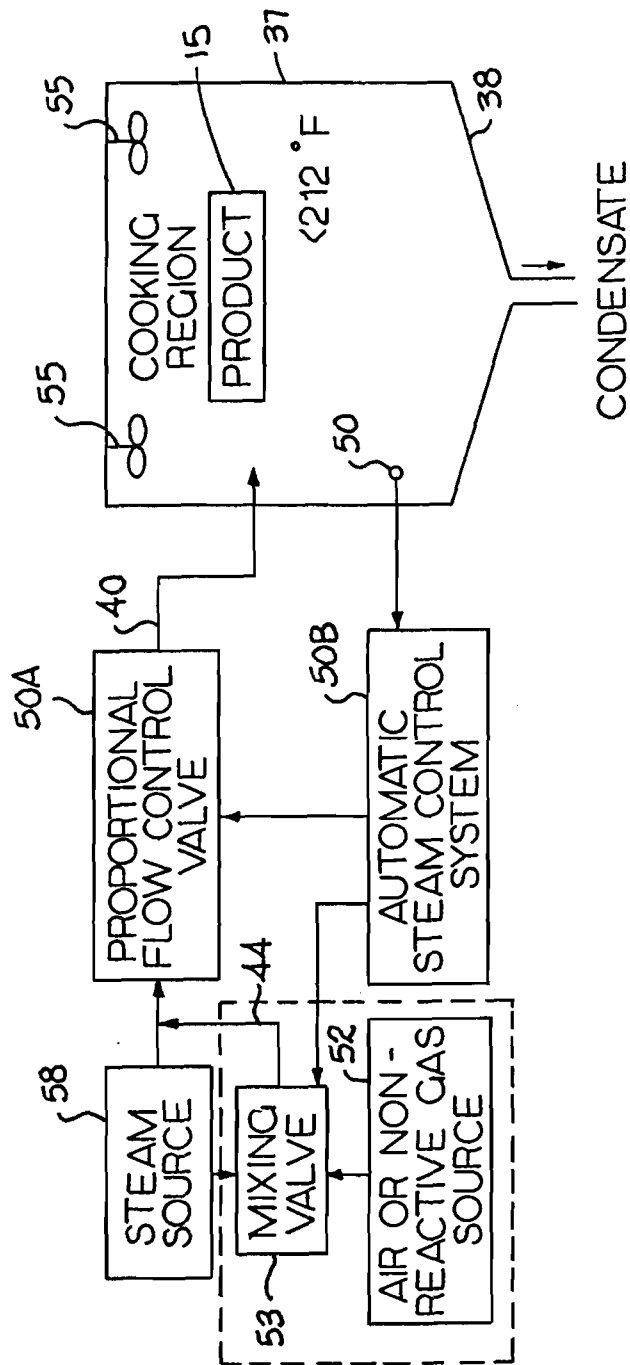


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/046122

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A23L 3/18 (2013.01)

USPC - 426/510

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) - A23L 1/00, 1/01, 1/315, 3/02, 3/16, 3/18, 3/36; A47J 27/04, 27/16 (2013.01)

USPC - 99/404, 443C, 477; 126/20, 369; 219/388, 401; 426/510, 511, 523

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

CPC - A23L 1/0121, 3/185 (2013.01)

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

PatBase, Google Patents, Google Scholar

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,410,951 A (LEDET et al) 02 May 1995 (02.05.1995) entire document	1-3
Y	US 4,737,373 A (FORNEY) 12 April 1988 (12.04.1988) entire document	1-3
Y	US 3,169,069 A (HANSON et al) 09 February 1965 (09.02.1965) entire document	3

☐ Further documents are listed in the continuation of Box C.


* Special categories of cited documents:

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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07 November 2013

Date of mailing of the international search report

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