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United States Patent [19]

Williams

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[45] **Reissued Date of Patent: * Jun. 4, 1996**

[54] **HIGH HUMIDITY STEAM COOKER WITH CONTINUOUSLY RUNNING CONVEYOR**

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[73] Assignee: **Hester Industries, Inc.**, Moorefield, W. Va.

[*] Notice: The portion of the term of this patent subsequent to Jan. 1, 2008, has been disclaimed.

[21] Appl. No.: **541,537**

[22] Filed: **Jun. 21, 1990**

Related U.S. Patent Documents

Reissue of:

[64] Patent No.: **4,582,047**
Issued: **Apr. 15, 1986**
Appl. No.: **060,986**
Filed: **Jul. 26, 1979**

U.S. Applications:

[63] Continuation of Ser. No. 182,203, Apr. 15, 1988, Reissue Patent No. 33,510.

[51] **Int. Cl.**[6] **A23L 3/06**
[52] **U.S. Cl.** ..... **126/369**; 99/443 C
[58] **Field of Search** ..... 99/352, 339, 362, 99/366, 370, 404, 425, 443 C, 467, 473, 475, 477; 62/264, 265, 412; 15/256.5; 98/36; 126/273 R; 198/229, 482, 494; 210/DIG. 25, 242, 540; 426/510, 571; 432/64, 65, 242

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[57] **ABSTRACT**

A steam cooker processes large quantities of food products such as meat, fish, poultry and produce passed therethrough in a spiral conveyor path. The continuously running conveyor is provided with loading and unloading stations outside the cooker and with a continuously operable spray detergent cleaning bath.

Efficient cooking is achieved without loss of humidity, flavor or appearance by maintaining water drop free steam at near 100° C. and 100% humidity at a pressure greater than atmospheric and by features of the apparatus including control of steam flow out of the cooking chamber and introduction of cold air thereinto.

Two separate steam sources, internal and external, are provided with the internal source comprising a heated pool of water on the floor of the cooker chamber, which is agitated for heat transfer efficiency and to remove fat or drippings from the cooking products.

Sanitation means include mounting of machinery parts outside the cooker, access to all sides of the cooking chamber for cleaning, an internal cleaning spray system and other apparatus features.

59 Claims, 4 Drawing Sheets

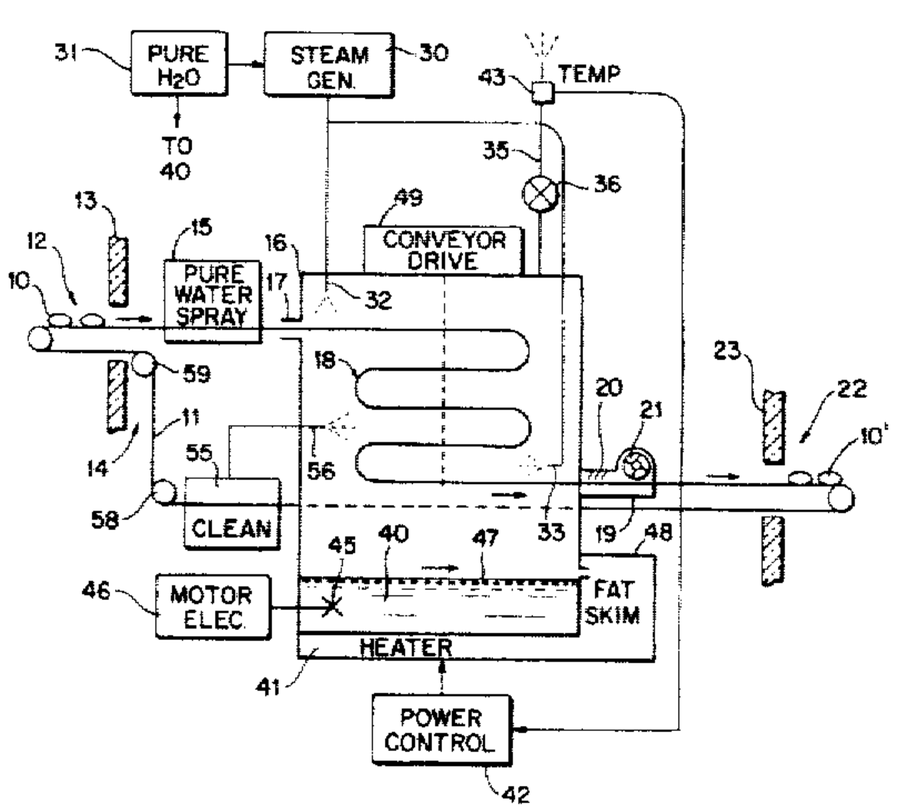

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FIG. 1

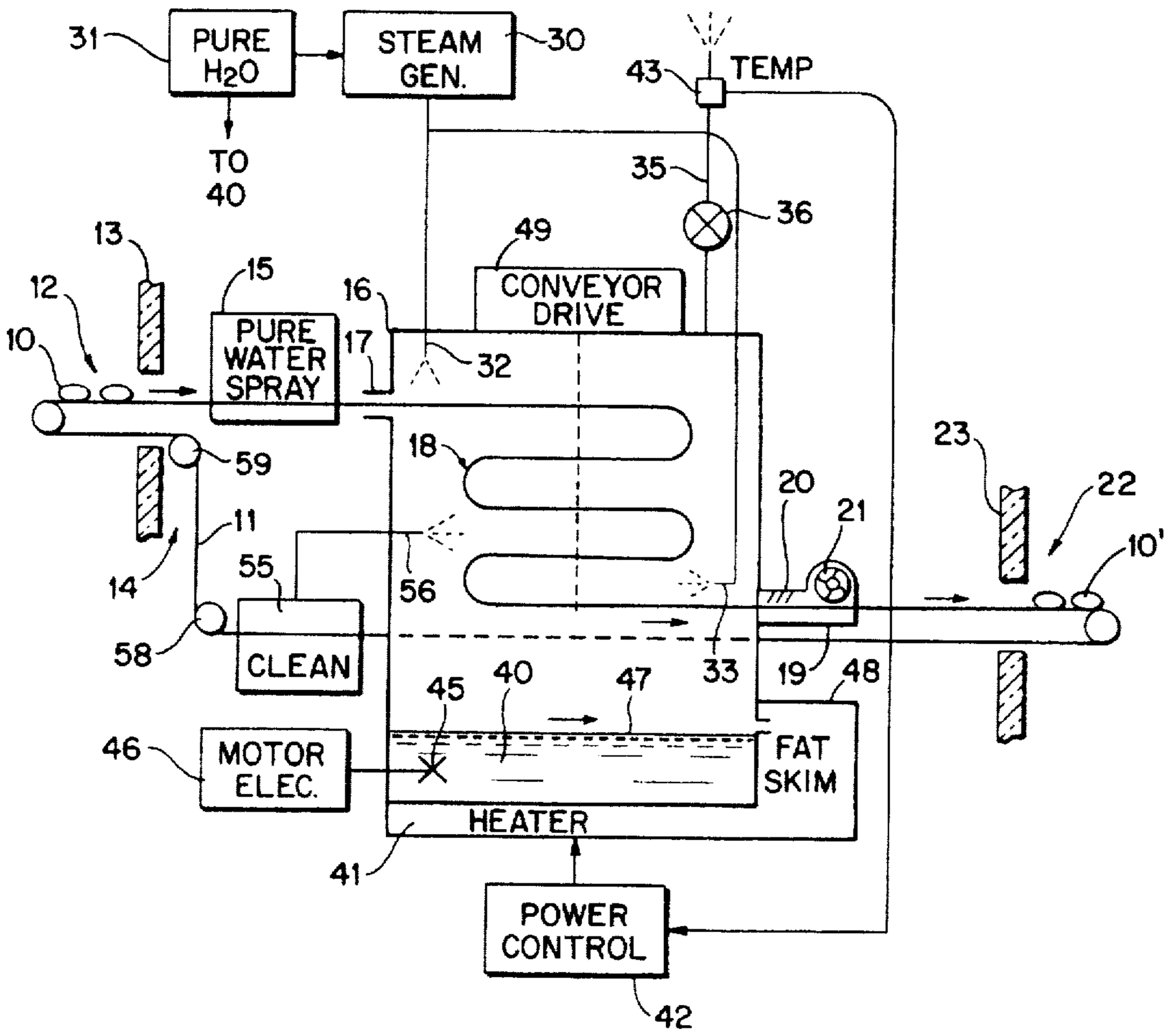
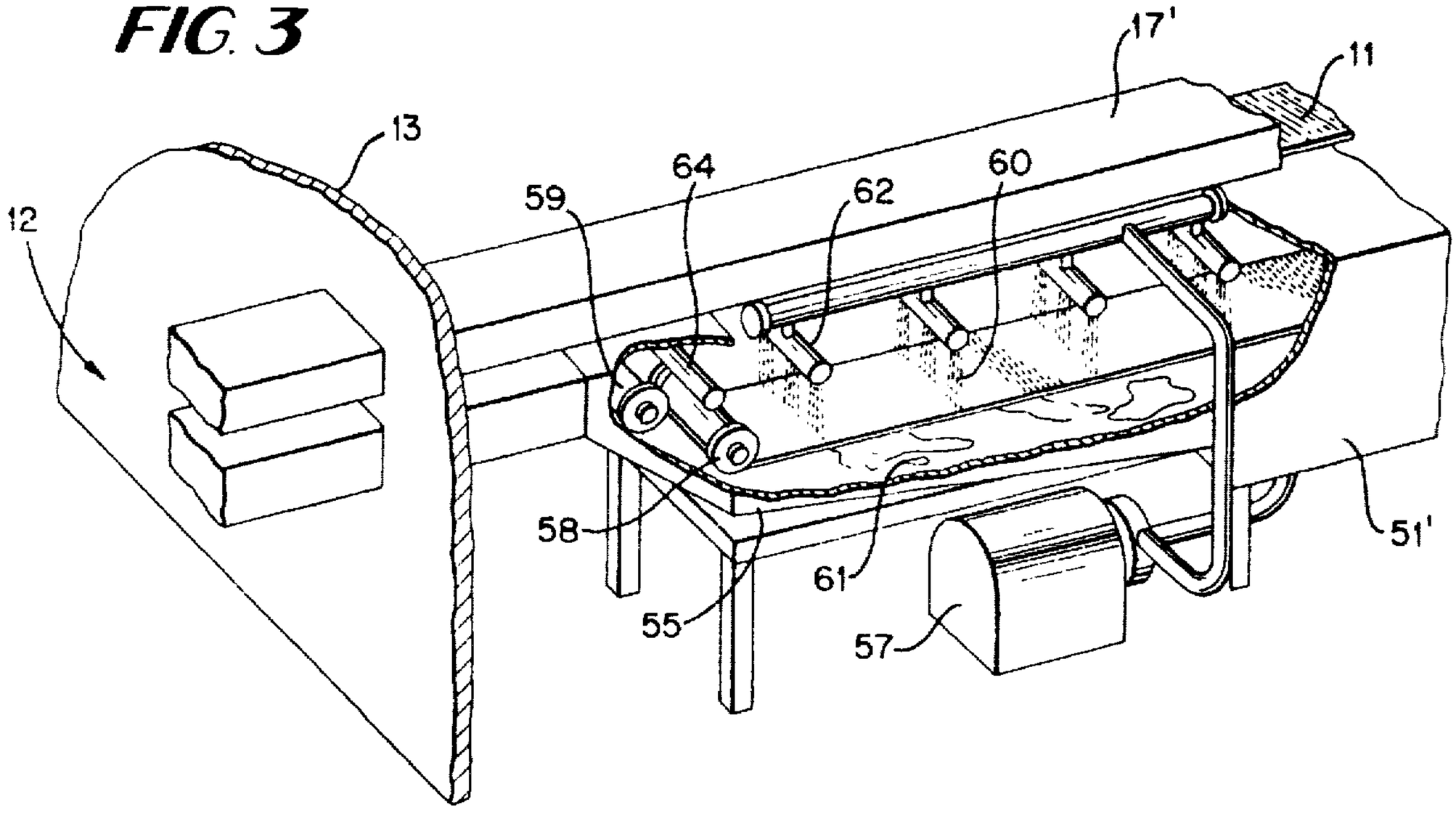

31
PURE H_2O
STEAM GEN.
30
43
TEMP
TO 40
35
36
49
CONVEYOR DRIVE
13
15
16
12
PURE WATER SPRAY
17
32
10
18
59
20
21
23
22
10'
11
55
56
14
58
CLEAN
33
19
48
45
40
47
46
MOTOR ELEC.
FAT SKIM
HEATER
41
POWER CONTROL
42

FIG. 3


17'
11
13
64
60
59
62
12
58
61
55
57
51'

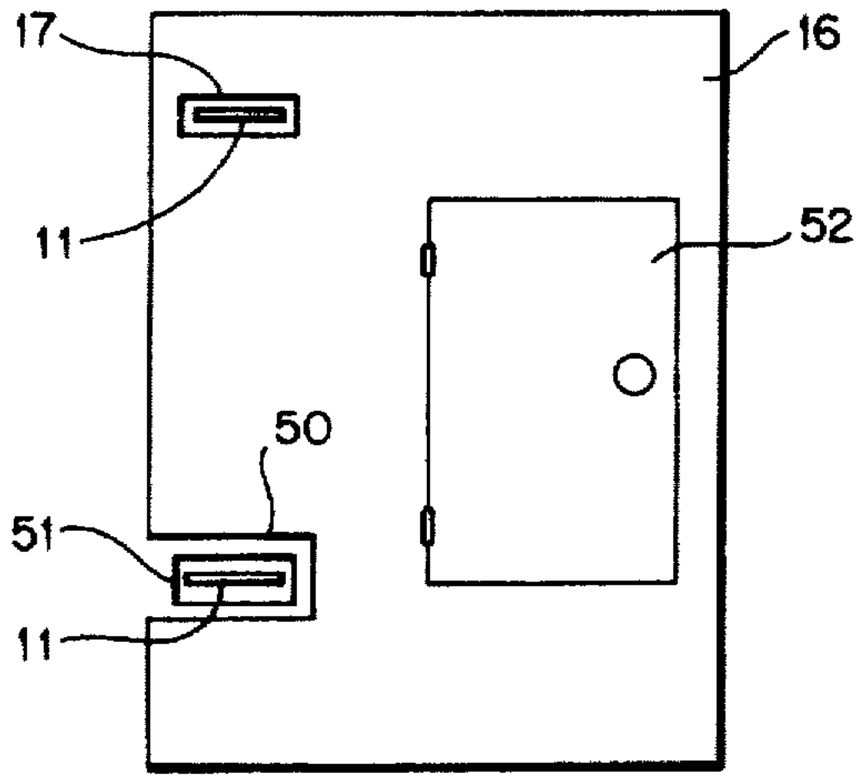


FIG. 2

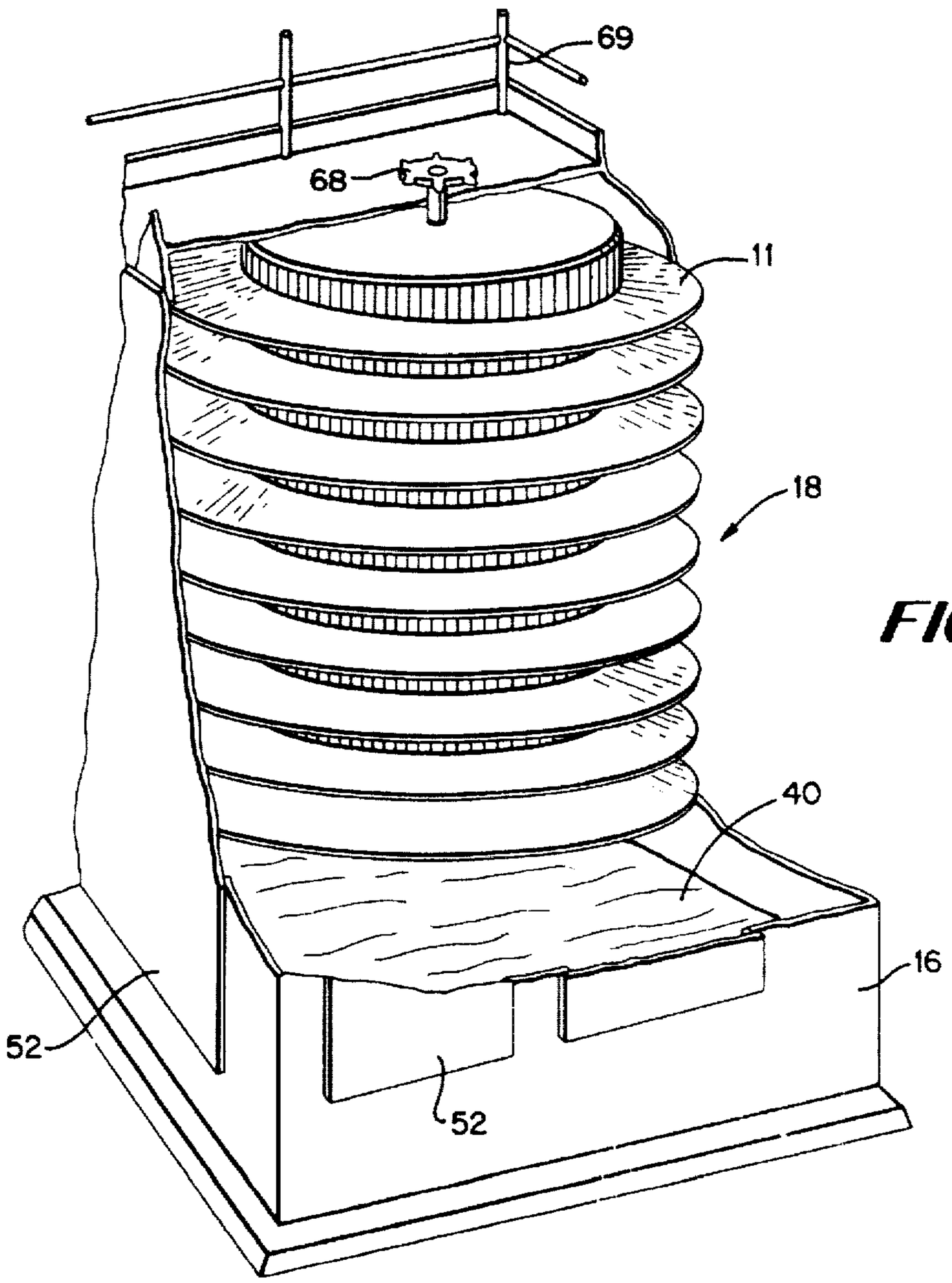


FIG. 4

FIG. 5

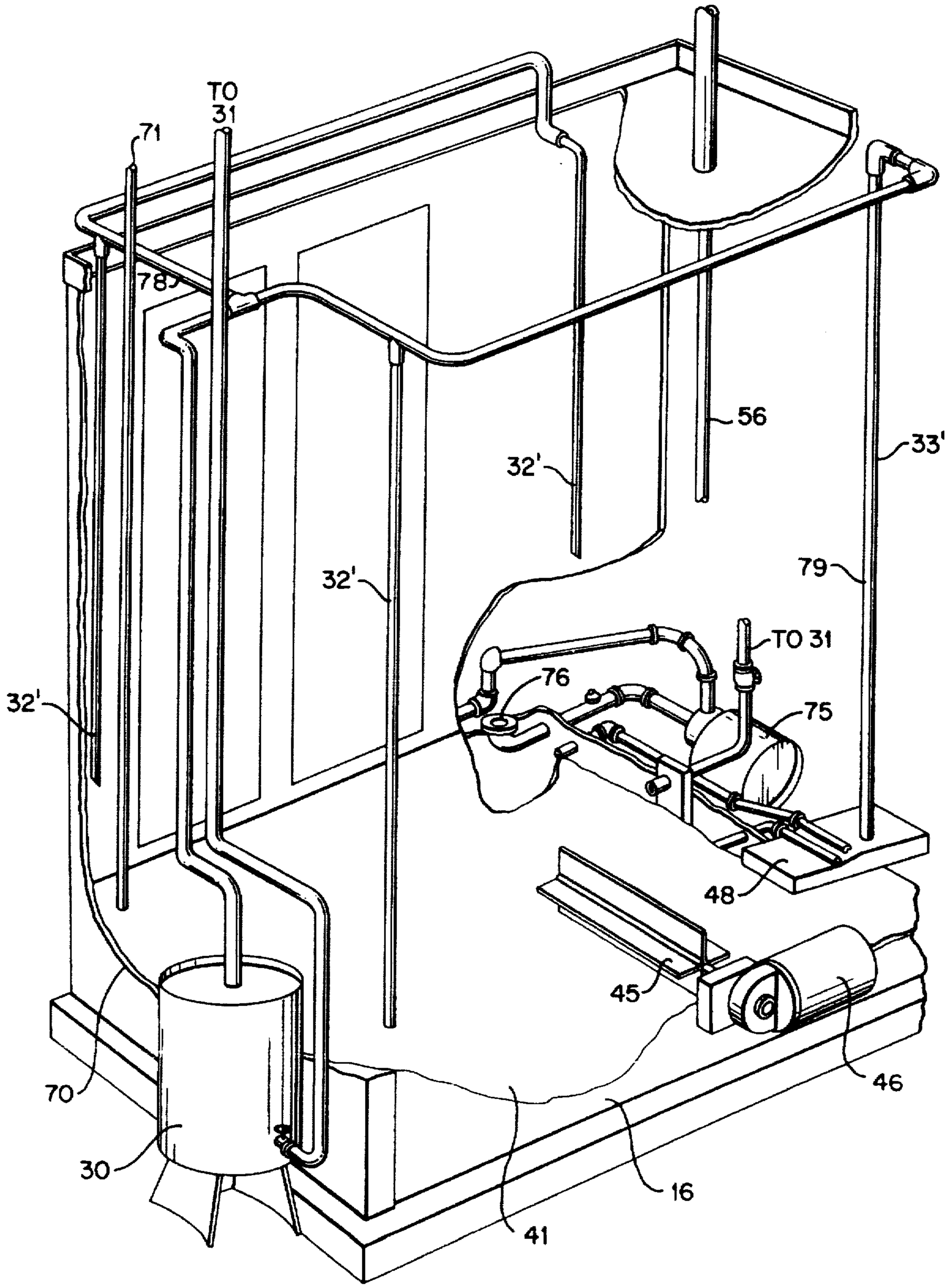
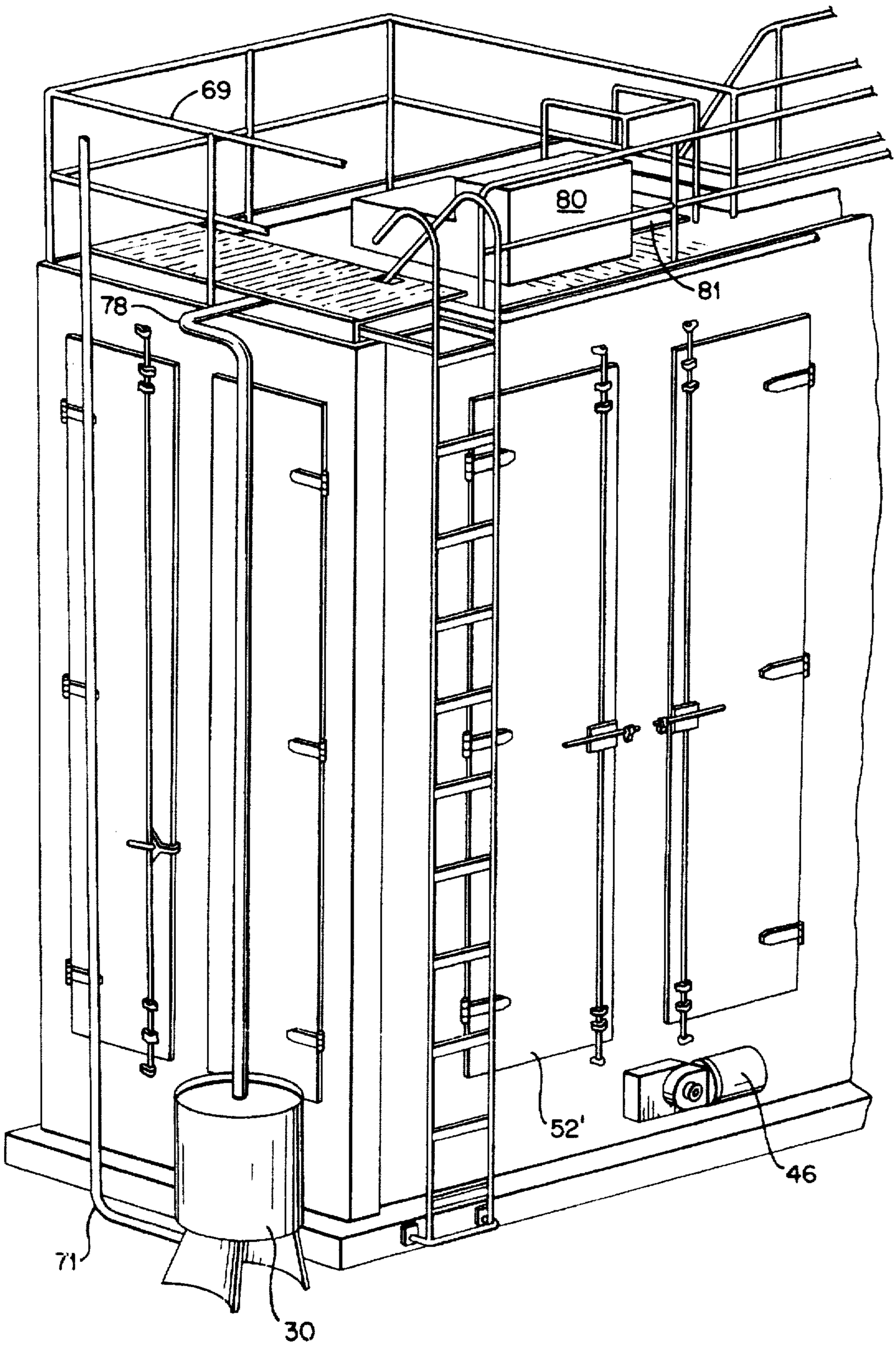


FIG. 6



HIGH HUMIDITY STEAM COOKER WITH CONTINUOUSLY RUNNING CONVEYOR

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

This is a continuation of Reissue application Ser. No. 07/182,203, filed Apr. 15, 1988, U.S. Pat. No. Re. 33,510 now allowed, which is based on original U.S. Pat. No. 4,582,047.

TECHNICAL FIELD

This invention relates to cookers and more particularly it relates to cookers through which are transported food products on a continuously moving conveyor belt.

BACKGROUND ART

In the field of industrial cooking requiring the rapid cooking and throughput of large quantities of food it has been customary to pass the food through a cooker on a conveyor belt. Typical examples of such prior art are as follows:

U.S. Pat. No. 3,982,481—E. T. Console et al. This shows a chamber through which a conveyor belt passes to carry produce for blanching in a steam spray.

Certified Manufacturing, Inc., Lynwood, Calif. 90262 has marketed gas fired broilers with A conveyor belt transport therethrough.

U.S. Pat. No. 1,491,958—J. F. Logan et al., uses a spiral conveyor to transport food in cans through a dry heat chamber.

However, in this type of prior art there are many unsolved problems relating to the cooking, the efficiency and the sanitation of conveyor type cooking systems.

Thus, particularly with rapid cooking techniques, the juices, essences and moisture is withdrawn from food products changing the appearance, flavor and texture thereof.

Also the cooking may not be uniform to the center of such products as meat which needs be cooked at the inner bone structure.

In general the food products present an interface to the heating medium that does not efficiently transfer heat, such as the fat skin layer of a piece of fowl. Also, such residue as fat drippings can significantly decrease heating efficiency.

Whenever a continuously running conveyor is used it tends to carry heat out of the cooker and cool air into it. This wastes energy and establishes an uncomfortable working environment for loading the conveyor.

Also the amount of energy carried out of a hood or exhaust system is significant, and in the case of steam heat for example, there can be significant heat loss by condensation of the steam into droplets.

The conveyor belts are difficult to sanitize, particularly in those systems that pass the belt back through the cooker to bake on residue. Other movable and irregularly shaped parts in or near cookers are apt to accumulate contaminating residue and breed bacteria. Also accessibility of the systems is in many cases difficult for takedown and entry into interior compartments for cleaning and sanitation.

Accordingly, it is an object of this invention to provide an improved, efficient, sanitary conveyor type cooker for food products that resolves the foregoing problems, and provides

other features and advantages which will be found throughout the following text.

BRIEF DISCLOSURE OF THE INVENTION

Food products such as fish, meat, fowl or produce are carried on a conveyor belt in a spiral path through a steam cooking chamber. The chamber is kept near 100° C. and 100% humidity by two steam sources both supplied with pure water and at a pressure above atmospheric in order to produce efficient rapid cooking without loss or humidity and with protection to appearance and flavor.

One steam source comprises a heat exchange surface in a pool of water on the floor or the chamber stirred to create heating efficiency and to skim off fat drippings from chicken or meat products. The other externally located steam generator has steam piped into the chamber.

The continuously running conveyor belt is passed on a return path outside the cooker through a continuously run spray detergent cleaning and sanitizing bath, and the internal parts of the cooker are all accessible by doors on all sides thereof. Driving machinery and elements requiring lubrication are all located outside the cooker to present simple sanitary surfaces for cleaning and sanitation. An internal cleaning spray system is also provided.

Other features are found hereinafter in the more detailed description of the preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a system schematic diagram showing the various features of the invention;

FIG. **2** is a side elevation sketch of the cooker cabinet afforded by the invention;

FIG. **3** is a diagrammatic view, partly broken away, of a continuous conveyor belt spray cleaner afforded by the invention;

FIG. **4** is a diagrammatic view in perspective, partly broken away, showing the spiral conveyor path within the cooker as afforded by this invention;

FIG. **5** is a diagrammatic view in perspective, partly broken away, showing the steam supply means for the cooker as afforded by this invention; and

FIG. **6** is a perspective view of the cooker cabinet array as provided by this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The overall system and combinational aspects of the cooking system provided by this invention are set forth in FIG. **1**. Thus, it is seen that food products **10** to be cooked are loaded on a conveyor belt **11** at the loading station **12** outside the cooker room wall **13**. Preferably the food products are substantially uniform in size and weight such as chicken legs, sized fish filets, steaks, etc. The products thus are loaded on the conveyor belt **11** at atmospheric pressure at loading station **12** outside the cooker room **14** which is kept at a pressure above atmospheric. This not only keeps the working conditions more comfortable but improves the cooking efficiency as hereinafter shown.

The products first undergo an optional pure water spray mist process at station **15** to wet the surface of the products for better heat interface exchange with the steam inside cooker housing **16**. It should be recognized that particularly in the case of meat products which are covered by a fat, this

wetting step is important to reduce the insulation characteristics and to achieve more efficient and rapid cooking.

The products are then passed through a duct **17** or opening in upper part of the cooker housing and through a spiral conveyor path **18** to assure the proper dwell time within the cooker at the chosen conveyor speed. The conveyor belt is of stainless steel for sanitary purposes and is not lubricated, since that would introduce contamination for food products.

The conveyor exits the cooker housing **16** at a lower duct **19** which is in the form of a trap reducing the steam and heat energy leaving the cooker on the conveyor belt **11**. Thus baffles **20** resist flow of hot air or steam out of the cooker housing **16** and fan **21** creates a counter flow of air at least sufficient to prevent any significant unnecessary outward flow of heat energy by way of gases carried outwardly by conveyor **11**. This fan can control the rate of fresh air flow into cooker housing **16** as later discussed.

The cooked food products **10'** are then conveyed to unloading station **22** outside cooker room **14** on the outside of wall **23**. The conveyor belt is typically wide enough for several side-by-side pieces of meat, produce, fish or poultry, for example, and a typical throughput is over a ton of raw products per hour with typical cooking times of 20 minutes between input loading station **12** and output unloading station **22**. The cooked product temperature is uniformly in the order of 97° C.

The cooking is solely with water droplet free steam near 100° C. and 100% humidity at a pressure above atmospheric. The high humidity atmosphere prevents losses of humidity of the product as it passes through the cooker and helps retain juices, essences and flavor of the product. Also it improves the heating steam interface heat exchange at the product surface for more efficient cooking.

The higher pressure not only produces a pressure-cooker like cooking efficiency to the cooking process, but is critical in connection with the flavor and conveyor type product flow as well. Thus, consider products loaded at the conveyor loading station **12** at atmospheric pressure when introduced into the cooking chamber will then tend to draw the steam internally within the cellular structure of the product for faster more intimate contact and quicker more uniform cooking throughout. This action also resists the leaking and removal of juices and essences of the product for better flavor control.

Part of the steam, typically 25%, is provided by an external steam generator **30** with filter to remove water droplets as supplied with pure water **31** to prevent contamination. This is piped to various locations **32**, **33** within the cooker to assure a constant circulating flow of steam near 100% humidity 100° C. atmosphere about the products being carried on belt spiral **18**. Also, for example, a jet **33** may flow steam in a direction counter the belt flow path to create a circulation path preventing undesired loss of steam out of duct **19** as the belt leaves the cooker, and together with fan **21** can create a desired ratio of input of outside air for circulation.

For this purpose an outlet stack **35** will let out of the cooking housing **16** an amount of steam flow controlled by valve means **36**.

The remaining steam is provided by an internal boiler having the pool of water **40** on the floor of the cooking chamber as heated by the heat exchange element **41**, To assure the right amount of steam and pressure within the cooking chamber, the power is controlled as a function of the temperature at the gas discharge stack **35** as sensed by temperature sensor **43**.

For better steam producing efficiency the water in pool **40** is circulated by means such as paddle wheel **45** and electric motor **46**. This is additionally used to improve steam production efficiency by creating a wave flow **47** travelling toward fat skimmer **48** which receives the crest of the waves on which the fat rides and removes the fat in the manner of a swimming pool skimmer mechanism. This prevents any accumulation of an insulating fat film on the pool **40** that prevents or reduces steam output, and further it removes a substance which could cause both sanitation and flavor problems if resident long in the cooker chamber. The fat is not thus broken down into a residue gas which would flavor the product adversely nor a scum which would not be easily sanitized. Also the fat may constitute a useable by-product.

To further improve sanitation, those elements which require lubrication or access for maintenance are located outside the cooking chamber, as exemplified by motor **46** and belt conveyor drive mechanism **49**. Also the belt **11** is returned from unloading to the loading station outside the cooking chamber as shown by the view of FIG. **2** where there is a niche **50** in the cooker housing **16** to permit a short return path through a conveyor duct **51**. The access doors **52** are supplied on all sides of the housing for accessibility for maintenance and sanitation.

Additionally a detergent spray system provides for continuous cleaning of the belt at **55** and for a spraying of the cooking chamber as depicted at spray outlet **56** with a sanitary detergent solution.

The belt cleaning spray mechanism is shown in detail in FIG. **3**, which with all succeeding figures uses similar reference characters for common features to facilitate comparison.

Installed in the return duct **51'** about the stainless steel conveyor belt **11** is a spray wash unit **55** powered by continuously running motor-pump **57**. The belt has interconnected stainless steel segments which permit travel around guide rollers **58**, **59** and other flow paths within the system. The conveyor belt **11** has a central open grating upon which the products rest which permits steam and detergent spray solution **60** to flow through the belt into sump **61** for recirculation by motor-pump **57**.

Sufficient spray nozzle arms **62** are provided with nozzle construction and spray pressure such as to dislodge any crumbs or drippings of the product remaining on the belt after cooking and unloading. A sanitary detergent solution is used to provide a sanitary belt for receiving a new loading of products at station **12** without contamination from the continuously running belt. Because the belt **11** does not return through the cooker, there is less tendency to bake on any residue and the cleaning function is simplified. Brushes may be used if desired and the brush **64** removes moisture from the roller **58** to keep the belt drier. It dries rapidly because it is warm after leaving the cooker and the reduced atmospheric pressure outside wall **13** permits quick evaporation of residue moisture. The solution in sump **61** is filtered for removing residue before recirculation by the pump, and the detergent solution can be changed as often as necessary to maintain strict sanitary conditions without possibility of introducing bacteria or retaining contaminating residue. Note all mechanisms such as pump **57** are kept outside the sanitary cooking compartment and ductwork **17'**, **51'** keeping any foreign substances off the belt **11**.

Features shown in FIG. **4** include the spiral path **18** taken by the belt **11** through the cooker chamber, access doors **52**, etc. for internal access, maintenance and sanitation and the placement of drive means such as chain sprocket **68** for

driving the conveyor belt through the spiral path **18** and its associated drive mechanisms. The catwalk array **69** gives a size perspective of the cooker housing **16**, and provides access to top entry panels and the mechanism **68** for maintenance. The spiral belt path may have as many convolutions as necessary to retain particular specialty products within the cooking chamber a desired dwell time for the desired belt travel speed.

Details of the heating mechanisms are shown in FIG. **5**. For sanitary purposes stainless steel is used wherever possible and the interior walls of the housing **16** are smooth to avoid any surfaces that could cause dripping or collect contamination, The interior **70** of the housing walls is insulated to preserve heat and to produce a safe and lower temperature outside wall environment around operational personnel.

The steam generator unit **30** could be any standard commercially available steam generator unit and is preferably made of stainless steel. It is coupled to a boiler for a supply of sanitary steam from pure water by means of piping **71**. Approved pure water make-up is entered from source **31** to assure sanitary steam. All piping is stainless steel sanitary steam pipe with pipe insulation having sanitary jacketing.

The floor water may be pumped out by pump **75** through drain **76** when sanitizing by detergents from piping **56**.

The fat skimmer duct **48** has internal baffling to reduce the loss of hot water and it leads to a settling tank (not shown) for segregation of fats.

The external steam is preferably disposed through piping **78** to the four corners of the cooking chamber and steam is released at nozzles **32'**, **33'** or along the length of the piping such as shown at **79** to provide proper mixture and saturation along the spiral conveyor path with the steam evaporated from the lower water pool.

Externally the cooking cabinet **16** is shown in FIG. **6**. The top housing **80** encloses the mechanisms for driving the spiral conveyor system within housing **16** and the top access door **81** permits entry for maintenance, inspection, sanitation and the like.

It is therefore evident that the steam cooking system provided by this invention has advanced the state of the art and provided many improved features. Those novel features believed descriptive of the spirit and nature of the invention are set forth with particularity in the appended claims.

INDUSTRIAL APPLICATION

Large volumes of food products are processed on a continuously running conveyor belt passing through an energy efficient steam cooker which preserves product humidity, flavor and appearance. Thus, fish, meat, poultry, produce and like food products can be cooked. There are self-cleaning and apparatus features for meeting the strictest of sanitation requirements.

I claim:

[1. A food cooking system cooking solely with steam foods such as fish, fowl, meats or produce carried through a cooker on a continuously running conveyor belt, comprising in combination, a cooker housing, means passing said conveyor belt through said housing to expose food products within the cooker housing only to said steam as the sole cooking medium, and two sources of steam providing said steam to cook the food products, nozzles for releasing steam located inside said housing, one comprising a steam generator supplying supplemental steam into said housing at said nozzles located thereinside to maintain the atmosphere together with the other steam source at near 100% humidity 100° C. and a pressure above atmospheric, and the other source of steam comprising a pool of water within said housing with heating means for boiling the water to create steam.**]**

[2. The system defined in claim **1** having a steam exhaust pipe, and heat control means for said pool of water regulated as a function of the temperature at said exhaust pipe.**]**

[3. The system defined in claim **1** having an opening in said housing into which said conveyor belt passes, and means establishing said steam pressure at a sufficient magnitude to discharge steam at a controlled rate from said housing about the entering conveyor belt.**]**

[4. The system defined in claim **3** with an opening in said housing out of which the conveyor belt passes, and having a steam flow path created within said housing by said nozzles tending to draw air into the latter said opening to produce a flow path out of the former opening thereby circulating air and steam.**]**

[5. A system as defined in claim **1** including means driving said conveyor belt through said housing with all mechanisms requiring lubrication mounted in a compartment outside the housing thereby to avoid food contamination.**]**

[6. A system as defined in claim **1** wherein the housing is positioned within a secondary housing such as a room where the pressure is maintained above atmospheric.**]**

[7. A system as defined in claim **6** including a station for loading food products through which said conveyor belt passes outside said secondary housing so that the food products are maintained at atmospheric pressure until they enter the cooker system whereby the increased pressure and high humidity cause efficient penetration of heat into the products to cook them evenly throughout by establishing a temperature approaching 100° C.**]**

[8. A system as defined in claim **1** adapted for processing meat and fowl products which may drip fat into said pool of water, including means continuously skimming the fat from the top of the water to improve the steam capacity thereof.**]**

[9. A system as defined in claim **8** wherein the fat skimming means comprises a paddle wheel on one side of the pool generating waves travelling to the other side of the pool and a fat skimmer receiving the crest of the waves and fat residing therein and removing such from the pool of water.**]**

[10. A system as defined in claim **8** wherein the heating means for the pool of water comprise heat exchange elements at the bottom of said housing, including means circulating the water over said heat exchange elements to improve the effective steam output efficiency.**]**

[11. A system as defined in claim **1** wherein said housing has access doors for entry thereinto on all sides.**]**

[12. A system as defined in claim **1** wherein the conveyor belt is passed inside said housing in a spiral path coiling downwardly to carry said foods through said housing from an upper to a lower position in said near 100% humidity atmosphere which prevents water dripping downwardly upon the foods being cooked on the belt.**]**

[13. A system as defined in claim **1** including means pre-moistening the food products on said conveyor belt before entry into said housing to thereby create an efficient heat interchange surface on the food products for heating by said steam.**]**

[14. The system defined in claim **13** wherein the conveyor belt path passes from a loading station at atmospheric pressure into an enclosure above atmospheric pressure and said moistening means comprises means located within said enclosure producing a fine spray mist covering the surface of the food product on the belt without droplets or steaming.**]**

[**15**. A self-contained continuous meat cooking system comprising:

a cooker housing which establishes an interior space;

meat-conveyance means for introducing meat into said interior space at an inlet of said cooker housing and for removing the meat from said interior space at an outlet of said cooker housing vertically spaced from said housing inlet;

said meat-conveyance means defining a spiral path of conveyance for said meat in said interior space, which spiral path includes a predetermined number of convolutions so as to establish a sufficient dwell time for the meat in said interior space as the meat is continually translated along said defined path between said housing inlet and said housing outlet;

said cooker housing including (i) an internal pool of water having a surface level below a lowermost one of said convolutions of said meat-conveyance means, and (ii) means in heat-exchange relationship to said pool of water for converting a quantity of water in said pool to steam which is contained within said interior space of said housing to thereby provide a steam atmosphere within said interior space to at least in part cook the meat during the continual translation of the meat along said spiral path, whereby cooked meat exits the cooker housing at said outlet thereof.]

[**16**. A meat cooking system as in claim **15**, which further comprises skimmer means for continually removing a residual floating film of meat-cooking by-products from said surface level of said pool of water.]

[**17**. A meat cooking system as in claim **16**, wherein said skimmer means includes a skimmer adapted to collect the removed meat-cooking by-products, and means for creating travelling disturbances on said surface level of said pool of water which cause said floating film to move towards said skimmer to be collected thereby.]

[**18**. A meat cooking system as in claim **15**, wherein,

said meat-conveyance means includes an endless conveyor for supporting said meat during its continual translation along said spiral path and which includes a return path exterior of said cooker housing between said outlet and inlet, and wherein the system further comprises

means located along said return path exterior of said cooker housing for cleaning said endless conveyor before it reenters said cooker housing inlet.]

19. A system for at least partially cooking substantially uncovered food products such as poultry parts, said cooking being performed at least in part with steam, said system comprising:

a housing defining an internal volume having a spiral conveyance path therein,

a conveyor belt disposed along said spiral conveyance path, said conveyor belt adapted for supporting and carrying said uncovered food products through said internal volume,

a belt drive mechanism coupled to said conveyor belt, said belt drive mechanism driving said conveyor belt to continually translate said belt along said spiral conveyance path through said housing to expose said supported and carried uncovered food products to a high humidity steam atmosphere,

a steam source operatively coupled to said housing, said steam source providing said high humidity steam atmosphere within said internal volume, said steam atmosphere directly contacting and at least partially cooking the uncovered food products, and

an internal cleaning spray arrangement at least in part disposed within said housing, said internal cleaning spray arrangement, in use, spraying the inside of said housing with a sanitizing solution.

20. A cooking system for cooking food products such as poultry, said cooking system comprising:

a housing including thermally insulated walls, said housing defining a spiral conveyance path therein;

a conveyor belt defining an open grating, said belt being disposed along said path, said conveyor belt adapted for supporting exposed food products;

a drive mechanism mechanically coupled to said belt, said drive mechanism moving said belt and said exposed food products supported thereon along said spiral path, said path having sufficient convolutions to retain said translating food products within said housing for a desired dwell time so as to heat said poultry products within said housing to a desired temperature;

a steam source coupled to said housing, said steam source providing a high humidity steam atmosphere within said housing, said high humidity steam atmosphere directly contacting outer surfaces of said exposed food products so as to at least in part heat and cook said food products; and

an internal cleaning spray arrangement at least in part disposed within said housing, said internal cleaning spray arrangement, in use, spraying the inside of said housing with a sanitizing solution.

21. A cooking apparatus adapted for cooking food products such as poultry parts having an outer fat layer, said apparatus comprising:

a housing defining a spiral conveyance path therein;

an endless belt at least partially disposed along said spiral path, said belt adapted for supporting and continually translating exposed food products along said spiral conveyance path; and

a steam source providing high humidity steam within said housing in direct contact with the outer surfaces of said exposed food products supported and translated by said belt so as to at least in part cook said food products while said food products are within said housing;

an arrangement coupled to said housing which continually removes fat byproducts from said housing while said food products are cooking within said housing; and

an internal cleaning spray arrangement at least in part disposed within said housing, said internal cleaning spray arrangement, in use, spraying the inside of said housing with a sanitizing solution.

22. A meat cooking apparatus as in claim 21 further including an automatic cleaning arrangement disposed outside said housing and in proximity to a portion of said belt, said cleaning arrangement continually cleaning said belt.

23. A cooking apparatus adapted for cooking food products such as poultry parts having an outer fat layer, said apparatus comprising:

a housing defining a spiral conveyance path therein;

an endless belt at least partially disposed along said spiral path, said belt adapted for supporting and continually translating exposed food products along said spiral conveyance path;

a steam source providing high humidity steam within said housing in direct contact with the outer surfaces of said

exposed food products supported and translated by said belt so as to at least in part cook said food products while said food products are within said housing; and

an arrangement coupled to said housing which continually removes fat byproducts from said housing while said food products are cooking within said housing,

said cooking apparatus further including a premoistening arrangement disposed in proximity to a loading portion of said belt, said premoistening arrangement premoistening surfaces of said exposed food products supported by said belt before said food products enter said housing so as to reduce insulation characteristics of said fat layer to thereby facilitate more rapid cooking of said food products by said steam.

24. A spiral steam cooker for at least partially cooking exposed food products in a high humidity steam atmosphere, said cooker comprising:

a housing defining an internal volume therein;

an endless conveyor belt at least partially disposed along a spiral conveyance path within said internal volume, said conveyor belt adapted for supporting and carrying said food products in an exposed manner through said internal volume;

a belt drive mechanism coupled to said conveyor belt, said belt drive mechanism driving said conveyor belt to continually translate along said spiral conveyance path,

a steam source providing said high humidity steam atmosphere within said internal volume, said high humidity steam atmosphere directly contacting and at least partially cooking the exposed food products, and

an internal cleaning spray arrangement at least in part disposed within said housing, said internal cleaning spray arrangement, in use, spraying the inside of said housing with a sanitizing solution.

25. A spiral steam cooker for heating and at least partially cooking exposed food products, said cooker comprising:

a housing defining an internal volume therein;

an endless conveyor belt at least partially disposed along a spiral conveyance path within said internal volume, said conveyor belt for, in use, supporting and carrying said exposed food products through said internal volume, said conveyor belt being adapted to continually translate along said spiral conveyance path through said housing,

a steam source disposed within said housing, said steam source providing a steam atmosphere within said internal volume, said steam atmosphere directly contacting and at least partially cooking the exposed food products, and

at least one additional source of heat introducing heat into said housing.

26. A cooker as in claim 25 further including means for continually removing liquified fat from said housing.

27. A cooker as in claim 25 wherein said steam source includes a heated pool of water disposed at the bottom of said housing.

28. A spiral steam cooker for at least partially cooking exposed food products, said cooker comprising:

a housing defining an internal volume therein;

a conveyor belt at least partially disposed along a spiral conveyance path within said internal volume, said conveyor belt for, in use, supporting and carrying said exposed food products through said internal volume, said conveyor belt adapted to continually translate along said spiral conveyance path through said housing; and

a steam source operatively coupled to said housing, said steam source providing a high humidity steam atmosphere within said internal volume, said high humidity steam atmosphere directly contacting and at least partially cooking the exposed food products, said steam source including at least one steam pipe for injecting steam into said housing and for substantially filling said housing with said high humidity steam atmosphere.

29. A food cooking system for cooking food products with steam as said food products are supported on a moving conveyor belt, said food cooking system comprising:

a cooker housing,

means disposed within said housing for defining a conveyance path,

a conveyor belt disposed along said conveyance path for supporting and carrying said food products along said path,

means coupled to said belt for causing said belt and said food products supported thereby to substantially continually translate along said conveyance path through said housing to expose food products within the housing to steam, said path retaining said translating food products within said housing for at least a desired dwell time, and

a source of steam providing steam to contact and cook the food products, said steam source comprising at least one of the following:

an external steam generator supplying steam into said housing, and

a pool of water within said housing with heating means communicating with said pool of water for creating steam,

wherein said steam source provides high humidity steam and said food products are directly exposed to said high humidity steam.

30. A food cooking system for cooking food products with steam as said food products rest on a moving conveyor belt, said food cooking system comprising:

a cooker housing,

means disposed within said housing for defining a conveyance path,

a conveyor belt disposed along said conveyance path for supporting and conveying said food products along said path,

means coupled to said belt for causing said belt and said food products supported thereby to substantially continually translate along said conveyance path through said housing to expose food products within the housing to steam, said path retaining said translating food products within said housing for at least a desired dwell time, and

a source of steam providing steam to contact and cook the food products, said steam source comprising at least one of the following:

an external steam generator supplying into said housing, and

a pool of water within said housing with heating means communicating with said pool of water for creating steam,

wherein steam within said housing condenses into a condensate and said steam source recirculates at least some of said condensate as steam.

31. A continuous food cooking system for cooking food products with steam, said food cooking system comprising:

a housing;

means for defining an internal conveyance path within said housing;

means disposed along said internal conveyance path for supporting and substantially continually translating food products along said internal path, said food products cooking while within said housing and producing a by-product, said path having sufficient convolutions to retain said translating food products within said housing for a desired dwell time; and

a steam source providing steam to contact and cook the food products, said steam source comprising at least one of the following:

an internal steam generator supplying steam into said housing, and

a pool of water within said housing with heating means communicating with said pool of water for creating steam,

wherein said steam source provides high humidity steam and said food products are directly exposed to said high humidity steam.

32. A continuous food cooking system for heating and at least partially cooking food products with steam, said continuous food cooking system comprising:

a housing;

a belt disposed along an internal spiral conveyance path within said housing, said belt, in use, supporting said food products such that said food products rest directly upon an upper surface of said belt, said belt substantially continually translating along said conveyance path within said housing so as to heat and at least partially cook said food products while said food products are within said housing;

a steam providing arrangement disposed, at least in part, within said housing for providing steam within said housing, said steam providing arrangement providing a high humidity steam atmosphere within said housing, said high humidity steam atmosphere which contacts, heats, and at least partially cooks said food products as said food products translate along said path;

a by-product removing arrangement for continually removing, from said housing, by-products such as fat released by said cooking food products; and

an internal cleaning spray arrangement at least in part disposed within said housing, said internal cleaning spray arrangement, in use, spraying the inside of said housing with a sanitizing solution.

33. A system as in claim 32 wherein said by-product removing arrangement is located at least partially within said housing.

34. A system as in claim 32 wherein said steam providing arrangement provides said high humidity steam atmosphere at near 100% humidity.

35. A system as in claim 32 wherein said by-product removing arrangement prevents fat released by said cooking food products from being broken down into a residue gas which would adversely flavor the food products.

36. A system as in claim 32 wherein said by-product removing arrangement cooperates with said housing to substantially prevent fat released by said cooking food products from forming a scum within said housing that is not easily removable from said housing.

37. A system as in claim 32 wherein said housing has first and second walls, and said system includes at least one access door in each of said first and second walls.

38. A system as in claim 32 wherein said system further includes a spray wash unit, wherein said belt passes through said spray wash unit so as to clean said belt.

39. A system as in claim 38 wherein said belt cleaning is performed on a substantially continuous basis.

40. A system as in claim 38 wherein said spray wash unit includes at least one spray nozzle which generates a liquid spray, and said belt has an open grating upon which the products rest, said open grating permitting said liquid spray to flow through said belt.

41. A system as in claim 38 wherein said spray wash unit includes a continually running motor-pump which continually recirculates at least a portion of said liquid spray through said spray wash unit.

42. A system as in claim 41 wherein said spray wash unit further includes a filter for filtering at least a portion of said liquid spray prior to recirculating.

43. A system as in claim 38 wherein said spray wash unit includes a sump for holding said liquid spray and permitting recirculation thereof.

44. A system as in claim 38 wherein said spray wash unit is adapted to spray a detergent spray solution.

45. A system as in claim 38 wherein said spray wash unit includes sufficient spray nozzles and provides sufficient spray pressure to as to dislodge crumbs and/or drippings remaining on the belt after said food products are unloaded from the belt.

46. A system as in claim 32 further including an outlet stack which lets steam flow out of said housing in a controlled amount.

47. A system as in claim 32 wherein convolutions of said belt disposed within said housing are not lubricated.

48. A system as in claim 32 further including a fan coupled to said housing for creating a flow of high humidity steam within said housing.

49. A system as in claim 32 further including a fan coupled to said housing for creating a gas flow which is counter to the direction of travel of said belt.

50. A system as in claim 32 wherein said belt is wide enough to support several side-by-side pieces of meat, produce, fish or poultry.

51. A system as in claim 42 wherein said system has a throughput capacity of in excess of a ton of food product per hour.

52. A system as in claim 32 wherein said system is capable of providing a dwell time of at least twenty minutes.

53. A system as in claim 32 wherein said system is capable of heating said food products to a temperature of at least 97 degrees centigrade.

54. A system as in claim 32 wherein said internal cleaning spray arrangement includes a spray pipe not used by said steam providing arrangement.

55. A system as in claim 32 wherein said steam providing arrangement provides a constant circulating flow of high humidity steam about the products being carried on said belt.

56. A system as in claim 32 wherein said steam providing arrangement includes means for flowing steam in a direction counter to the direction of translation of said belt to create a circulation path.

57. A system as in claim 32 wherein said steam providing arrangement creates a circulation of steam within said housing.

58. A system as in claim 32 further including a circulation fan for introducing a desired ratio of outside air into the housing for circulation.

59. A system as in claim 32 wherein a portion of said belt is disposed along a path outside of said housing, and a belt

cleaning system continually cleans said portion of said belt outside of said housing.

60. A system as in claim 32 further including an arrangement for recovering said removed by-products so as to permit said by-products to be useable.

61. A system as in claim 32 wherein said housing has at least one opening through which said belt travels, and said system further includes means for resisting the flow of hot air or steam out of said housing.

62. A system as in claim 32 wherein said by-product removing arrangement prevents any accumulation of fat film on a surface near the bottom of said housing.

63. A system as in claim 32 wherein said by-product removing arrangement includes a means outside of said housing for segregating fats from said by-product.

64. A system as in claim 32 further including a belt drive mechanism disposed outside of said housing, said belt drive mechanism causing said belt to translate.

65. A system as in claim 32 wherein said belt path has as many convolutions as necessary to retain particular specialty products within the housing for a desired dwell time and belt travel speed.

66. A system as in claim 32 wherein said housing walls are insulated to preserve heat and to produce a safe and lower temperature outside wall environment.

67. A system as in claim 32 wherein said steam providing arrangement includes a steam generator unit external to said housing.

68. A system as in claim 67 wherein said steam providing arrangement has components made of stainless steel.

69. A system as in claim 67 wherein said steam providing arrangement is adapted to be coupled to a boiler.

70. A system as in claim 67 wherein said steam providing arrangement is adapted to be supplied with sanitary steam, and includes a stainless steel sanitary steam pipe with pipe insulation having sanitary jacketing.

71. A system as in claim 32 wherein said housing has a floor with a drain therein.

72. A continuous food cooking system for heating and at least partially cooking food products with steam, said continuous food cooking system comprising:

a housing;

a belt disposed along an internal spiral conveyance path within said housing, said belt, in use, supporting said food products such that said food products rest directly upon an upper surface of said belt, said belt substantially continually translating along said conveyance path within said housing so as to heat and at least partially cook said food products while said food products are within said housing;

a steam providing arrangement disposed, at least in part, within said housing for providing steam within said housing, said steam providing arrangement providing a high humidity steam atmosphere within said housing, said high humidity steam atmosphere which contacts, heats and at least partially cooks said food products as said food products translate along said path; and

a by-product removing arrangement for continually removing, from said housing, by-products such as fat released by said cooking food products,

said system further including:

a gas discharge stack for discharging steam from said housing; and

a temperature sensor coupled to said gas discharge stack, said temperature sensor sensing the temperature of the steam discharged by said gas discharge stack.

73. A system as in claim 72 wherein said steam providing arrangement is responsive to said sensed temperature.

74. A system as in claim 72 wherein said steam providing arrangement provides an amount of steam responsive to the temperature sensed by said temperature sensor.

75. A continuous food cooking system for heating and at least partially cooking food products with steam, said continuous food cooking system comprising:

a housing;

a belt disposed along an internal spiral conveyance path within said housing, said belt, in use, supporting said food products such that said food products rest directly upon an upper surface of said belt, said belt substantially continually translating along said conveyance path within said housing so as to heat and at least partially cook said food products while said food products are within said housing;

a steam providing arrangement disposed, at least in part, within said housing for providing steam within said housing, said steam providing arrangement providing a high humidity steam atmosphere within said housing, said high humidity steam atmosphere which contacts, heats and at least partially cooks said food products as said food products translate along said path; and

a by-product removing arrangement for continually removing, from said housing, by-products such as fat released by said cooking food products,

said system further including a heat source in addition to said steam providing means, said additional heat source introducing additional heat into said housing for heating and at least in part cooking said food products.

76. A continuous food cooking system for heating and at least partially cooking food products with steam, said continuous food cooking system comprising:

a housing;

a belt disposed along an internal spiral conveyance path within said housing, said belt, in use, supporting said food products such that said food products rest directly upon an upper surface of said belt, said belt having an open grating which permits steam and liquid to flow through said belt, said belt substantially continually translating along said conveyance path within said housing so as to at least partially cook said food products while said food products are within said housing;

a steam providing arrangement disposed within said housing for providing steam within said housing, said steam providing arrangement providing a high humidity steam atmosphere within said housing, said high humidity steam atmosphere contacting and at least partially cooking said food products as said food products translate along said path; and

an internal cleaning spray arrangement at least in part disposed within said housing, said internal cleaning spray arrangement, in use, spraying the inside of said housing with a sanitizing solution.

77. A system as in claim 76 wherein:

said housing further includes a floor with a drain; and

said system further includes means for selectively permitting said sanitizing solution to exit said housing through said drain.

* * * * *