United States Patent [19]

Schlotthauer

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[45] **July 17, 1973**

[54] **CEREAL TOASTING OVEN**

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[73] Assignee: **Lassen Foods, Inc.**, Paradise, Calif.

[22] Filed: **Sept. 23, 1971**

[21] Appl. No.: **183,163**

[52] **U.S. Cl.** **99/323.9**, 99/489

[51] **Int. Cl.** **A23l 1/10**

[58] **Field of Search** 99/237, 234, 235, 99/236, 80–81, 238; 263/33; 99/323.9, 485, 501, 488, 489

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Assistant Examiner—Arthur O. Henderson
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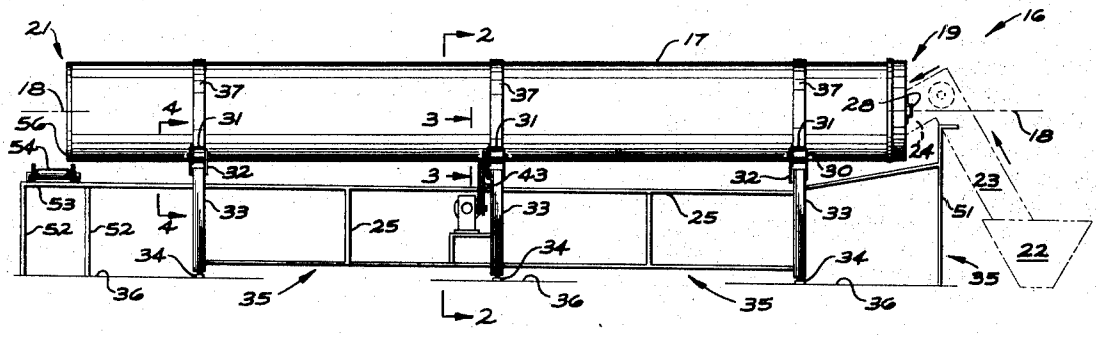
[57] **ABSTRACT**

An elongated drum is mounted on rollers for rotation about its longitudinal axis. In order to move the cereal through the oven, the drum axis is inclined somewhat downwardly from a higher end, where the somewhat moist cereal mixture is introduced, to a lower end, where the dried and toasted cereal emerges. Drying and toasting is effected by a gas flame merging from gas pipe extending through the interior of the drum. Adjacent the input end of the drum a scraper blade is suspended from the gas pipe to within a fraction of an inch from the drum's inside bottom wall so as to dislodge any still moist cereal from adhering to the drum's inside wall. The scraper ends at a location where the cereal is sufficiently dry so that the tendency of the cereal to adhere to the wall no longer obtains. From this location to the outlet end of the drum, longitudinal ribs are provided to tumble the cereal and thereby equally toast the cereal throughout as the cereal advances through the rotary drum toward the discharge end.

5 Claims, 13 Drawing Figures



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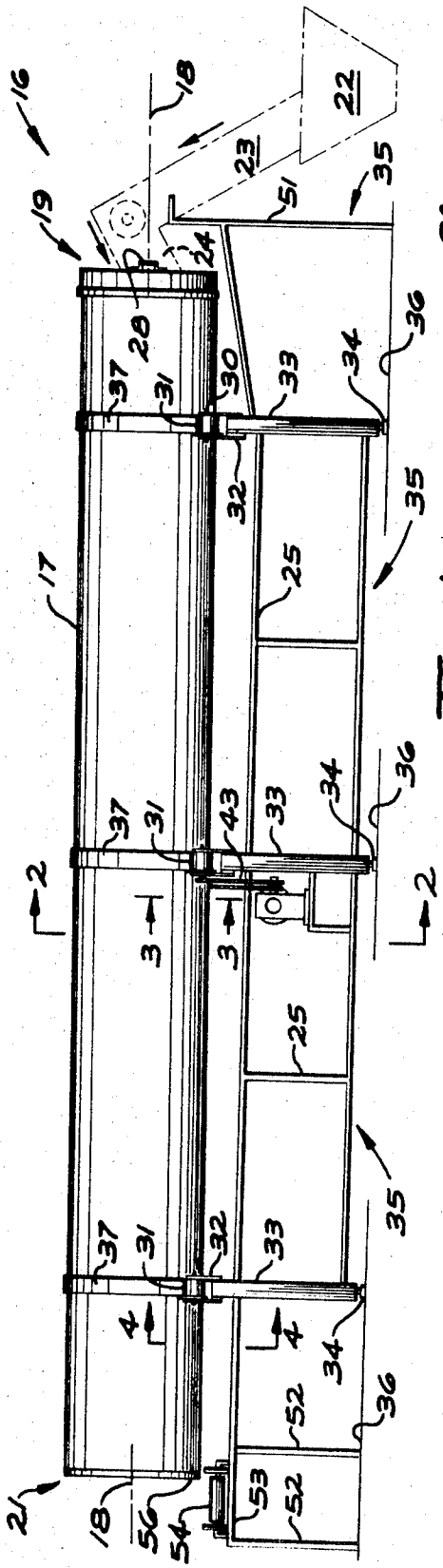

FIG. 1.

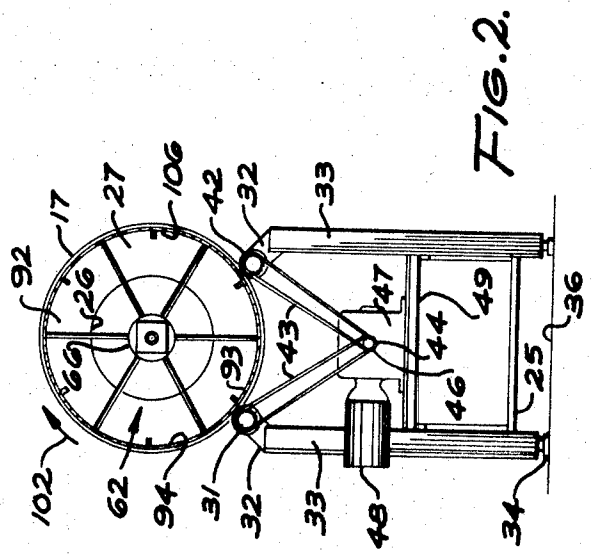

FIG. 2.

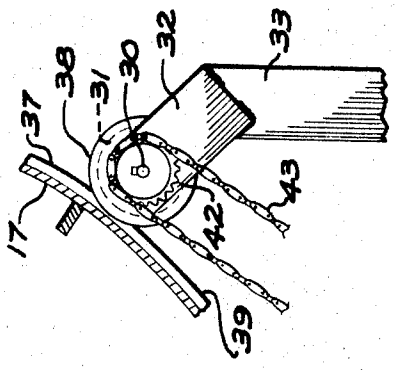

FIG. 3.

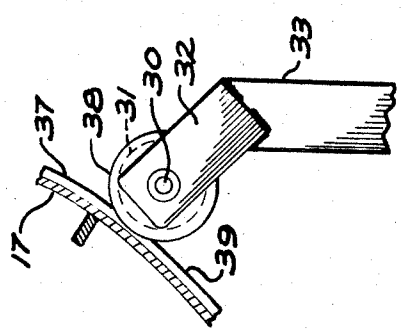

FIG. 4.

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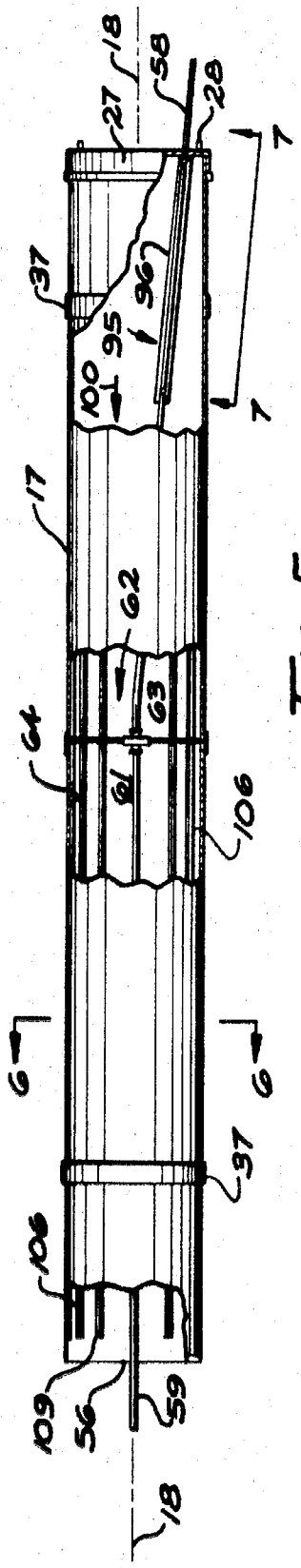

FIG. 5.

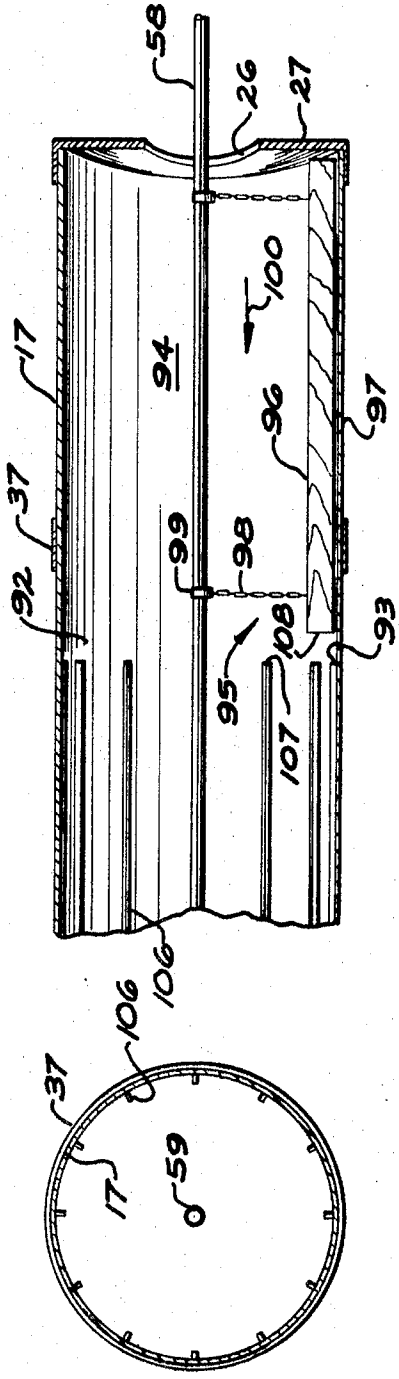

FIG. 7.

FIG. 6.

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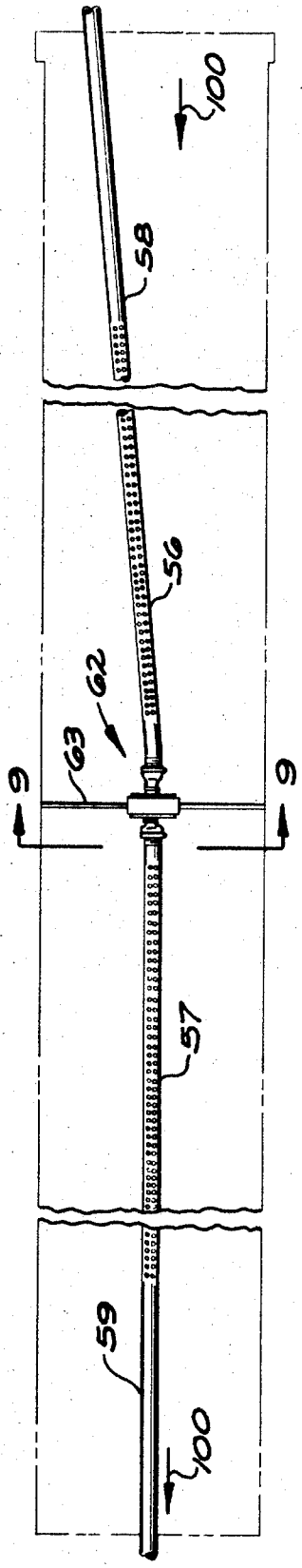

FIG. 8.

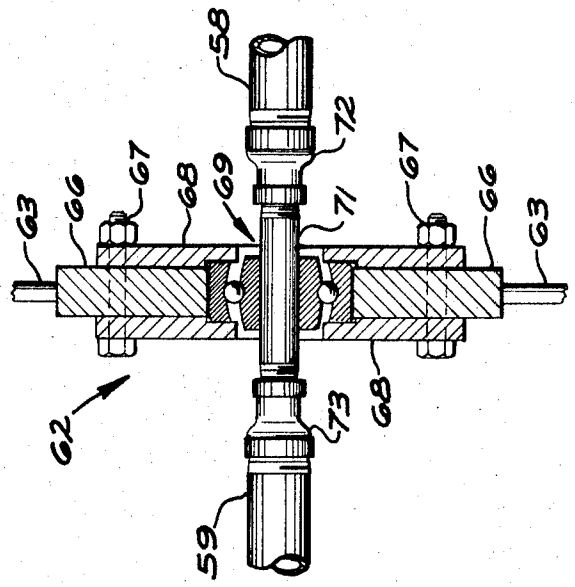

FIG. 10.

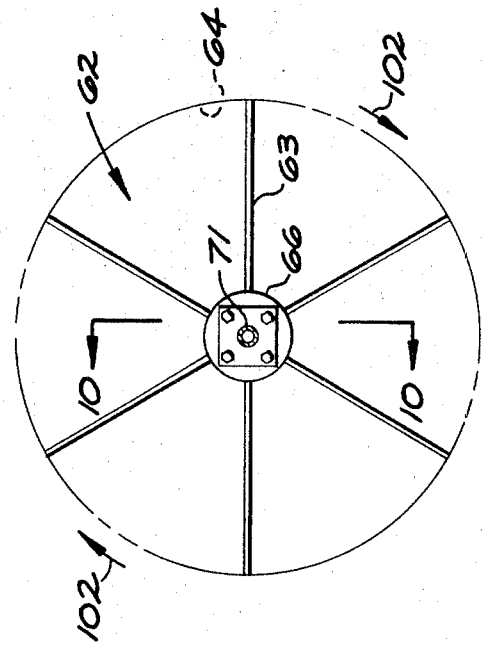

FIG. 9.

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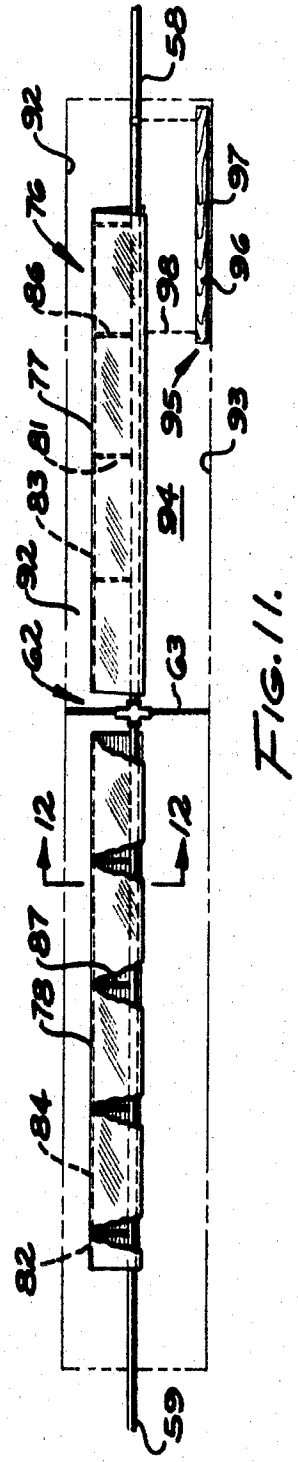

FIG. 11.

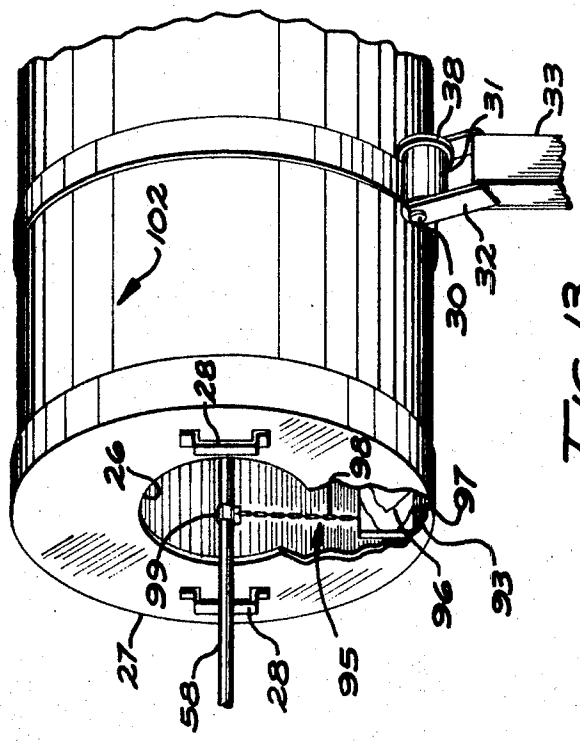

FIG. 13.

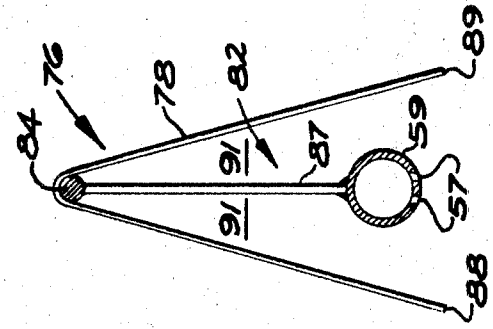

FIG. 12.

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CEREAL TOASTING OVEN

The invention relates to improvements in ovens for toasting cereals, especially of the dry, ready-to-serve breakfast food type.

It has long been recognized that the toasting of grains and cereals not only improves the flavor and appearance of the product, but also enhances its assimilative and other properties, as well. Rotary ovens of the kinds heretofore used have served satisfactorily where the cereal preparations have consisted either of a single type of grain or even of two or three different kinds of grains in the company of a light syrup, for example. However, where grains, possibly some rolled and some ground, are accompanied by numerous non-grain components such as yeast, soya oil, brown sugar, coconut and honey, the ovens heretofore available, whether of the steam heat or of the dry heat type, have left much to be desired with respect to uniformity in toasting.

It is therefore an object of the invention to provide a cereal toasting oven which yields an evenly toasted product.

It is another object of the invention to provide a rotary oven for toasting multi-component, ready-to-eat breakfast foods which affords a high degree of quality control so that continued product uniformity in the market place is assured.

It is a further object of the invention to provide a rotary oven for toasting cereals which is relatively compact and inexpensive, both as to installation and upkeep, yet is rugged, durable and long-lived.

It is still a further object of the invention to provide a cereal toasting oven, which can safely and reliably be operated and maintained even by relatively unskilled personnel, and which, when once adjusted, can be operated for protracted periods without further adjustments.

It is another object of the invention to provide a rotary oven which is versatile in that it can readily be adjusted and controlled to meet the varying requirements of different kinds of grain and cereal types of foods.

It is yet another object to provide a generally improved cereal toasting oven.

Other objects, together with the foregoing, are attained in the embodiment described in the following description and illustrated in the accompanying figures, in which:

FIG. 1 is a side elevational view of the oven showing, in broken line, a hopper and an elevator for introducing the measured ingredients of the cereal;

FIG. 2 is a transverse sectional view showing the drum rotating mechanism and the gas pipe supporting spider, the plane of the section being indicated by the line 2 — 2 in FIG. 1;

FIG. 3 is a fragmentary sectional view, to an enlarged scale, of the roller drive, the plane of the section being indicated by the line 3 — 3 in FIG. 1;

FIG. 4 is a fragmentary sectional view, to an enlarged scale, of a supporting roller, taken on the line 4 — 4 in FIG. 1;

FIG. 5 is a top plan view of the oven, with portions broken away to reveal interior details;

FIG. 6 is a sectional view, to an enlarged scale, of the drum, illustrating the longitudinal, cereal-tumbling ribs;

FIG. 7 is a fragmentary sectional view, to an enlarged scale, of the scraper structure adjacent the inlet end of the drum, the plane of the section being indicated by the line 7 — 7 in FIG. 5;

FIG. 8 is a fragmentary bottom plan view, to an enlarged scale, of the gas pipe and central supporting spider;

FIG. 9 is a sectional view, to a further enlarged scale, of the spider, the bearing and the gas pipe structure journaled therein, taken on the line 9 — 9 in FIG. 8;

FIG. 10 is a fragmentary sectional view, to a still further enlarged scale of the spider bearing and attendant gas pipe structure, taken on the line 10 — 10 in FIG. 9;

FIG. 11 is a side elevational view of the gas pipe and attendant thermal hood structure;

FIG. 12 is a transverse sectional view, to an enlarged scale of the hood, taken on the line 12 — 12 in FIG. 11; and,

FIG. 13 is a fragmentary, perspective view, to an enlarged scale, of the inlet end of the oven, a portion of the end closure being broken away to show the manner of suspension of the scraper blade from the gas pipe, and a typical drum supporting roller.

While the cereal toasting oven of the invention is susceptible of numerous physical embodiments depending on the environment and requirements of use, substantial numbers of the herein shown and described embodiment have been made and used, and all have performed in an eminently satisfactory manner.

The rotary oven of the invention, generally designated by the reference numeral **16**, comprises an elongated drum **17** rotatable about its longitudinal rotational axis **18**. The drum axis **18** and drum **17** decline from an elevated, cereal-input end **19** to a lower, cereal-discharge end **21** thereby advancing the cereal by gravity through the entire length of the drum. A hopper **22** adjacent the input end receives the various weighed components of the cereal mixture which, in a typical product, might comprise rolled oats, brown sugar, unsweetened coconut, sesame seed, honey, soya oil, almonds, wheat germ, food yeast, salt and vanilla flavoring.

A bucket elevator **23** lifts the cereal out of the hopper **22** and drops it on a downspout **24** which directs the cereal through a central opening **26** (see FIGS. 7 and 13) in an annular closure cap **27** on the input end of the drum. The cap is frictionally held on the end of the drum and is provided with hand-holds **28** for convenience in removing and installing the closure.

The drum **17** is supported for rotation on a plurality of transversely arranged pairs of rollers **31**, the roller pairs being spaced substantially equally along the length of the drum. Each of the rollers includes a pair of stub shafts **30** mounted between and journaled on a spaced pair of mounting brackets **32** (see FIGS. 1 and 13) carried on the upper end of a vertical post **33** supported on vertically adjustable pads **34** supported on the floor **36**. Suitable structural shapes **25** form, with the posts **33**, an elongated drum-supporting frame, generally designated by the reference numeral **35**.

The rollers **31** each engage and roll against the surface a wear band **37** encompassing the drum; and to prevent any endwise, translational movement of the drum **17** toward the lower, left-hand end **18**, as appears in FIG. 1, under the force of gravity, the left-hand end of each of the rollers **31** is provided with a flange **38** forming a shoulder against which the lower edge **39** (see FIGS. 3 and 4) of the wear band **37** abuts.

The shafts 30 of the intermediate set of rollers 31 (supporting the central portion of the drum 17) are keyed at one end to a sprocket gear 42 engaged by a chain 43 driven by a drive sprocket 44 mounted on the end of a shaft 46 projecting from the housing of a reduction gear 47 connected to a variable speed electrical drive motor 48, the drive motor 48 and reduction gearing 47 being supported by a suitable platform 49 adjacent the central transverse framework of the longitudinal main frame 35. The upstream end of the framework 35 includes stanchions 51 supporting the cereal elevator 23 and the discharge end of the framework 35 includes stanchions 52 and platform 53 supporting a belt conveyor 54 located below the drum discharge zone 56 (see FIGS. 1 and 5).

Toasting of the cereal introduced at the intake end 19 is effected by a hot, dry atmosphere inside the drum created by a gas flame resulting from the burning of gas emitted from two parallel rows of perforations 56 and 57 (see FIGS. 8 and 12) in the bottom of two separate gas pipes 58 and 59, respectively, each pipe being connected to its own source of fuel and each being controlled by conventional gas regulator valves and thermostats (not shown).

The gas pipe 58 extends into the drum 17 at an angle of approximately 12° relative to the longitudinal axis 18. The pipe is laterally displaced from the center of the circular opening 26 in the end closure cap 27, where the gas pipe enters the drum, so as to give room to the discharge end of the elevator down-spout 24 which protrudes centrally through the opening 26.

The angled gas pipe 58 substantially intersects the axis 18 (see FIGS. 5 and 8) in the central zone 61 of the drum and is there supported by a spider structure 62 comprising a star-shaped array of rods 63 mounted at their outer extremities on the inner wall 64 of the drum 17 as by welding.

The polarly arranged rods 63 converge in a central hub 66 mounted by fasteners 67 to a spaced pair of clamping plates 68, as appears most clearly in FIG. 10. An anti-friction bearing 69 carried by the central hub and plate structure journals a solid rod 71, or plugged pipe, to which is screwed, at opposite ends, a pair of fittings 72 and 73 connected, respectively, to gas pipes 58 and 59.

The spider structure 62, in other words, provides the gas pipes 58 and 59 with support in the center of the drum and yet allows the drum to rotate freely. The external portions of the two gas pipes are supported, as by ceiling-hung brackets, (not shown) and, as previously indicated, each pipe has its own fuel source and controls (not shown). Thus, each half of the drum can be separately heated to its own optimum atmosphere, thereby affording great flexibility in heating the particular cereal in the manner desired so as to achieve the uniform golden brown color characterizing the properly toasted product, this criterion being readily recognized by one skilled in the art.

The kind, amount, and nature of the product, and its ingredients, the diameter, length and inclination of the drum, as well as the drum's rotational velocity, are some of the variables to be accounted for when adjusting the atmosphere inside the drum to effect optimum toasting of the cereal being processed. Experience, for the most part, will quickly dictate the respective rates of gas flow as between the two burner pipes 58 and 59 so as to achieve the desired degree of toasting.

A further important adjunct to the thermal pattern in first drying and then toasting the cereal flowing through the drum is a thermal baffle, generally designated by the reference numeral 76, comprising an upstream hood 77 and a downstream hood 78 (see FIGS. 11 and 12) supported by respective trusses 81 and 82 vertically upstanding from the gas pipes 58 and 59, respectively. Each of the hoods 77 and 78 is of sheet metal material formed to an inverted V-shape, the apices of the hoods being supported on the substantially horizontal bars 83 and 84 of the respective trusses 81 and 82. The vertical truss members 86 and 87, respectively, are welded on the tops of the gas pipes 58 and 59, and the hoods 77 and 78 depend by gravity from the bars 83 and 84, thereby affording ready removal and installation.

As appears most clearly in FIGS. 11 and 12, the lower margins of the hoods, such as the two margins 88 and 89 of the hood 78, are below the gas outlet ports 57. Thus, as the gas emitted from the ports 57 commences to burn and becomes hot, the flame recurves upwardly on each side of the pipe 59 and tends to rise into the converging chamber 91 defined by the inverted V-shaped hood 78, and there dissipates in the sense that the flame subsides while the heat therefrom recurves downwardly and outwardly from the margins 88 and 89, thence upwardly into the upper, or dome, portion 92 of the drum.

The cereal on the lower, or basin, portion 93 of the drum, and, more particularly, that portion which is carried up the side wall 94 of the drum is thereby shielded from direct contact with the flame. At the same time, however, convection currents and radiation from the hoods inner surfaces enhance the thermal efficiency of the heat source, by beaming downwardly on the basin portion of the drum where the main cereal stream is located. It is further to be noted that since the length of each hood is less than the length of the respective underlying gas pipe measured over the portion inside the drum, a still greater flexibility is afforded in controlling the thermal pattern within the drum. In other words, by shifting the hoods back and forth on the respective supporting trusses, convective flow and radiation from the hoods can be emphasized in either a fore or aft direction relative to the drum axis.

Closely allied to the thermal pattern of the desiccating and toasting atmosphere of the drum is the cereal scraper structure, generally designated by the reference numeral 95, comprising a substantially horizontal scraper blade 96 having its lower edge 97 in close juxtaposition to the drum basin 93. The blade 96 is suspended by a pair of chains 98 from clamps 99 mounted on the gas pipe 58 in the vicinity of the intake opening 26 (see FIG. 13). Being mounted on the angularly oriented gas pipe 58, the scraper blade 96 partakes of the same angularity as the pipe and thereby tends to deflect in a downstream direction as indicated by the arrows 100, any cereal that tends to adhere to the inner wall 64 of the drum and move up the side wall 94 as the drum rotates in the direction indicated by the arrow 102 in FIGS. 2, 9 and 13.

As will be noted, the scraper structure extends for only a few feet from the cereal inlet opening 26 to a location downstream where the cereal is dry enough so that it no longer possesses a tendency to stick to the drum side wall. In other words, where the product is somewhat moist, or includes ingredients of a tacky na-

ture, such as honey, the product tends to adhere to the drum wall and move upwardly as the wall rises toward the dome. By scraping the product from the drum wall while the material is still tacky, the ingredients are channeled forwardly along the drum basin until they are somewhat dried; and upon being released at the downstream end of the scraper blade **96** they are dry enough so that they do not tend further to adhere to the drum wall.

Thereafter the product is subjected to a continuous buffeting and tumbling action by a plurality of longitudinal ribs **106,** or fins, or vanes, which extend from a location **107** just downstream from the trailing end **108** of the scraper blade **96** to a location **109** (see FIG. **5**) immediately preceding the cereal discharge zone **56,** where the product, having completed the toasting process, spills out the lower end of the drum and onto the transverse conveyor belt **54** for removal to inspection and storage or immediate packaging.

It can therefore be seen that I have provided an efficient, yet compact, durable and reliable rotary oven for uniformly toasting cereal grains of many different kinds, textures and characteristics.

What is claimed is:

1. A cereal toasting oven comprising:

a. an elongated frame including a plurality of vertical support members;

b. rollers journaled on said support members;

c. an elongated drum supported on said rollers for rotation about the longitudinal axis of said drum, said axis and said drum being downwardly inclined from a first cereal input end to a second cereal output end, said drum including an upper dome portion, a bottom basin portion and a pair of lateral side wall portions;

d. electrical drive means for rotating said drum at a selected speed;

e. heating means within said drum for toasting the cereal introduced into said drum at said input end and discharged at said output end: said heating means including a perforated elongated gas pipe extending at least partially through said drum, control means on said gas pipe for regulating the extent of gas flow emitted through the perforations in said gas pipe and burned inside said drum, and baffle means associated with said gas pipe for directing the flow of heated air within said drum; and,

f. flight means mounted on the inner wall of said drum for tumbling the cereal moving from said input end toward said output end.

2. A cereal toasting oven as in claim **1** wherein said perforations are on the bottom of said gas pipe, and wherein said baffle means includes an inverted V-shaped hood overlying and being spaced from the lateral sides of said gas pipe.

3. A cereal toasting oven as in claim **2** including a spider transversely mounted on the inner wall of said drum intermediate the opposite ends of said drum; and bearing means at the center of said spider for journaling said gas pipe.

4. A cereal toasting oven comprising:

a. an elongated frame including a plurality of vertical support members;

b. rollers journaled on said support members;

c. an elongated drum supported on said rollers for rotation about the longitudinal axis of said drum, said axis and said drum being downwardly inclined from a first cereal input end to a second cereal output and, said drum including an upper dome portion, a bottom basin portion and a pair of lateral side wall portions;

d. electrical drive means for rotating said drum at a selected speed;

e. heating means within said drum for toasting the cereal introduced into said drum at said input end and discharged at said output end;

f. flight means mounted on the inner wall of said drum for tumbling the cereal moving from said input end toward said output end, said flight means including a plurality of elongated ribs mounted on said inner wall of said drum for engaging, elevating and spilling cereal encountered by said ribs as said ribs revolve about said axis and carry cereal from said bottom basin portion of said drum up one of said lateral side walls thereof; and,

g. a scraper member located adjacent said input end of said drum in close juxtaposition to said lower basin portion of said drum for scraping engagement with cereal disposed in said basin.

5. A cereal toasting oven as in claim **4** wherein said heating means includes a perforated elongated gas pipe extending at least partially through said drum; and wherein said gas pipe adjacent said input end of said drum is angularly oriented in a substantially horizontal plane including said axis of rotation of said drum; and wherein said scraper member includes an elongated blade suspended from said portion of said gas pipe adjacent said input end of said drum.

* * * * *