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# Automatic or mechanized food-process lines


## Abstract

An improvement for automatic/mechanized food-process lines pertains to racking provisions for assembling, dis-assembling and re-assembling numerous separate machines that form to make up the line. That is, one machine can be swapped out for a different machine in order to cause a change in the output food product pieces. For example, a swapped in machine may give a different coating to the food product pieces (eg., breading vs. Panko) or run food product pieces of substantially different character (eg., whole muscle pieces like chicken tenders vs. formed product like hamburger patties). The improvement has a track attached or affixed to either a low elevation mounting structure of a given food process line machine or the factory floor, but not the other, and a router member attached or affixed to the other of the low elevation mounting structure or the factory floor, for following the track.



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**U.S. PATENT DOCUMENTS**

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## Background/Summary

CROSS-REFERENCE TO PROVISIONAL APPLICATION(S) (1) This application claims the benefit of U.S. Provisional Application No. 63/186,080, filed May 8, 2022. The foregoing patent disclosure(s) is(are) incorporated herein by this reference thereto.

BACKGROUND AND SUMMARY OF THE INVENTION
(1) The invention generally relates to automatic and/or mechanized food-process line equipment and, more particularly, to racking and alignment provisions for assembling, dis-assembling and then re-assembling the numerous separate machines that are formed up to make an automatic and/or mechanized food-process line. One flexibility of such automatic and/or mechanized food process lines is that one machine can be swapped out for a different machine in order to cause a change in the output food product pieces. For example, a swapped in machine may give a different coating to the food product pieces (eg., breading vs. Panko) or run food product pieces of substantially different character (eg., whole muscle pieces like chicken tenders vs. formed product like hamburger patties).
(2) A number of additional features and objects will be apparent in connection with the following discussion of the preferred embodiments and examples with reference to the drawings.

## Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) There are shown in the drawings certain exemplary embodiments of the invention as presently preferred. It should be understood that the invention is not limited to the embodiments disclosed as examples, and is capable of variation within the scope of the skills of a person having ordinary skill in the art to which the invention pertains. In the drawings,
(2) FIG. **1**A is a perspective view of a characteristic automatic and/or mechanized food-process

line;
(3) FIG. **1**B shows fairly much the same subject matter of FIG. **1**A except in a block diagram fashion, and taken from a top plan vantage point, wherein the arrows indicate the direction of flow of the food product pieces (not shown) from upline (right) to downline (left);
(4) FIG. **2** is an enlarged-scale perspective view of detail II-II in FIG. **1**A and comprises coating apparatus like for example and without limitation as shown by U.S. Pat. No. 9,687,018—Nothum, Jr., et al., "Food process-line coating apparatus with exchangeable substitution or elimination of accessories of the tumbling and/or flipping nature;"
(5) FIG. **3** is a reduced-scale side elevation view of the machine in FIG. **2** except furthermore situated between an immediately upline machine to the right and an immediately downline machine to the left, and in FIG. **3** for the first time the racking and alignment provisions in accordance with the invention are slightly visible, as beneath at least two of the machines;
(6) FIG. **4** is an enlarged-scale top plan view taken in the direction of arrows IV-IV in FIG. **2**;
(7) FIG. **5** is an enlarged-scale side elevation view taken in the direction of arrows V-V in FIG. **2**;
(8) FIG. **6** split perspective view wherein the bottom half of the view and the top half of the view are different kinds of perspective views, wherein the bottom half of the view is a top perspective view of the track shown in FIG. **4**, and, the top half of the view is a bottom perspective view of (eg., looking up at) the bottom wall of the food-process line machine in FIG. **4**, showing a slowly-driven gear-toothed router wheel in accordance with the invention mounted on a drive shaft projecting out of the bottom wall of the food-process line machine;
(9) FIG. **7**A is a top plan schematic view of FIG. **3**, showing a line of three food-process line machines in series, wherein the left and right (downline and upline) machines are racked and aligned in the preferred alignment for them, but the center machine is in the process of making a docking or parking maneuver from approaching from an outside five o'clock position on an imaginary clock dial in FIG. **7**A;
(10) FIG. **7**B is a top plan schematic view comparable to FIG. **7**A except showing the center machine half through a pivot from the outside five o'clock position on the imaginary clock dial (eg., FIG. **7**A) to being momentarily during its pivot being lined up on an axis from four o'clock to ten o'clock on the imaginary clock dial;
(11) FIG. **7**C is a top plan schematic view comparable to FIG. **7**B except showing the center machine racked and aligned in the preferred alignment for it, oriented on a three o'clock to nine o'clock axis, parallel with (or preferably centered on) the longitudinal axis of near symmetry of the automatic and/or mechanized food process line;
(12) FIG. **8** is a perspective view comparable to FIG. **6** except of a second embodiment of a track in accordance with the invention and an associated router member for cooperating with the track except this router member is fixed (eg., it is a peg or stylus), and moreover it is fixed to the factory floor whereas the track is affixed to the bottom wall of the food-process line machine;
(13) FIG. **9** is a perspective view comparable to FIGS. **6** and **8** except of a third embodiment of a track in accordance with invention and an associated slowly-driven gear-toothed router wheel in accordance with the invention, which is furthermore complimented by (flanked between) a pair of cam roller wheels, wherein during parking or docking maneuvers the slowly-driven gear-toothed router would engage the toothed sidewall of the track and the cam roller wheels would engage the featureless (smooth) sidewall of the track;
(14) FIG. **10** is a top perspective view of FIG. **9**, with portions removed from view and other portions shown schematically in broken line, to show better that the cam roller wheels are mounted at the bottom of shafts which have upper ends mounted at the outer ends of spring-biased arms, which pivot about pivot axes through the inner ends of the arms to induce (a) the cam roller wheels to stay engaged with the featureless (smooth) sidewall and (b) the slowly-driven gear-toothed router wheel to stay engaged with the gear-tooth formed sidewall;
(15) alternatively, the pivoting of the arms may be mechanically driven by a drive source as well;

and
(16) FIG. **11** is a perspective view comparable to FIGS. **6**, **8** and **9** and more closely comparable to FIG. **9** except of a fourth embodiment of a track in accordance with invention, comprising a monorail track in contrast to slots or channels shown previously, and an associated slowly-driven gear-toothed router wheel in accordance with the invention furthermore complimented by a pair of cam roller wheels, wherein during parking or docking maneuvers (a) the slowly-driven gear-toothed router wheel to stays engaged with the gear-tooth formed sidewall of the monorail track and (b) the cam roller wheels stay engaged with the featureless (smooth) sidewall of the monorail track.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

(17) FIG. **1**A is a perspective view of a characteristic automatic and/or mechanized food-process line **20** for which the various improvements in accordance with several embodiments of the invention are intended to benefit:—and for several parties including the process line **20** owners and operators, the process line **20** workers and, surprisingly, the consuming public in broadening the array of different kinds and characteristics of food-stuffs which can be outputted by switching around the food-process line **20** quickly from one set-up of machines **100** (including without limitation such specific examples as **10**T, **10**X, **10**D, **10**W, **10**C, **10**Z and **10**S described more particularly below) to a re-configured different set-up of machines **100**.

(18) FIG. **1**B shows fairly much the same subject matter of FIG. **1**A except in a block diagram fashion, and taken from a top plan vantage point, wherein the arrows indicate the direction of flow of the food product pieces (not shown) from upline (right) to downline (left). As mentioned before, the automatic and/or mechanized food-process line **20** is assembled from several different machines **100** (or equipment or apparatus), some of which are more typically included in food-process line **20** than others, but all depends on the desired end result.

(19) Starting at the left side of the view, the symbol “PT” might signify a fryer **10**T like for example and without limitation as shown by U.S. Pat. No. 6,305,274—Nothum, Sr., et al., entitled “Fryer for food process lines” (“PT” being an abbreviation for applicant's designation ProTherm).

(20) The symbol “PF” in the view might signify a transfer conveyor **10**X like for example and without limitation as shown by U.S. Pat. No. 10,329,092—Nothum, Jr., et al., “Pivoting and reversibly expanding-contracting transfer conveyor for food process lines” (“PF” being an abbreviation for applicant's designation PivoFlex).

(21) The symbols “SF” appearing twice in the view might signify a dry coating apparatus **10**D like for example and without limitation as shown by U.S. Pat. No. 9,687,018—Nothum, Jr., et al., “Food process-line coating apparatus with exchangeable substitution or elimination of accessories of the tumbling and/or flipping nature” (“SF” being an abbreviation for applicant's designation “SuperFlex”).

(22) The symbol “BP” might signify a batter (eg., wet coating) machine **10**W like for example and without limitation as shown by U.S. Pat. No. 6,510,810—Nothum, Sr., et al., “Convertible combination batter mixer and applicator machine” (“BP” being an abbreviation for applicant's designation BatterPro).

(23) The symbol “PV” might signify a pre-dusting station **10**C like for example and without limitation as shown in U.S. Pat. No. 8,096,259—Nothum, Jr., et al., “Gutters and plows for coating-material recirculation in food-coating apparatus.” (“PV” being an abbreviation for applicant's designation Pro VersaCoat).

(24) In FIG. **1**B, the furthest T-shaped block on the right might represent one or two machines **100** or operations of any of the following types of machines or operations: a food-product forming operation (indicated as **10**Z in FIG. **1**B) like for example and without limitation as shown in U.S. Pat. No. 7,886,657—Nothum, Jr., “Integrated compact food process line and process;” a particularizing loader like for example and without limitation as shown in U.S. Pat. No. 8,678,886—Nothum, Jr., “Food-product loader for food process lines;” or a bulk loader (eg., hopper)

(indicated as **10**S in FIG. **1**A) like for example and without limitation as shown in U.S. Patent Application Publication No. 2021/0205835—Nothum, Jr., "Work-saving improvements for food-process lines."

(25) It is an aspect of business in this industry that these kinds of automatic and/or mechanized food-process lines **20** have to be assembled and disassembled constantly and frequently, for many reasons including for cleaning (ie., to sanitize or disinfect) the line **20**, for maintenance, and then also for re-configuring the line-up of machines **100** or the swapping in and out of other machines **100** to produce a different food product (eg., to substitute in a Panko machine like for example and without limitation as shown in U.S. Pat. No. 9,521,862—Nothum, Jr., "Food product coating apparatus for Panko crumb and the like."

(26) (The foregoing body of patent disclosures are hereby incorporated herein by this reference thereto.)

(27) It is an object of the invention to speed up the disassembly and re-assembly process.

(28) FIG. **2** is a perspective view of a characteristic machine **100** in automatic and/or mechanized food-process lines **20**. For sake of example, this machine might be a drum-tumbling crumb coating machine **10**D (eg., SF in FIG. **1**B). In alternative generic terminology, this form of machine **10**D might be referred to as drum-tumbling dry coating machine **10**D. This machine **10**D, as typical of all the other machines **100** except the fryer **10**T (PT in FIG. **1**B), rolls on casters **30** across the factory floor **32** (or at least on roller-footed feet **30**). The weight of the machine **10**D is carried by the casters **30** (or roller feet). In FIG. **1**, this food-process line **20** machine **100** line-up would be assembled by originally rolling the transfer conveyor **10**X (PV) up to the fryer **10**T (PT) and docking it there. The transfer conveyor **10**X can be a fairly light machine and perhaps one worker could manage this by themself. But heavier machines like dry coating apparatus **10**D "SF" and wet coating apparatus **10**W "BP" for sure are plural worker operations. The fryer **10**T (PT) doesn't readily move. The fryer **10**T (PT) is a much larger, longer and heavier machine, and it has a lot of utilities hooked up to it (eg., thermal oil circulation, perhaps the frying oil supply too). The fryer **10**T (PT) is more less a permanent fixture.

(29) So such food process lines **20** have heretofore typically been built from the most immovable machine:—the fryer **10**T (PT). The fryer **10**T (PT) is for all practical purposes the downline endpoint for food process steps or operations that distinguish the food product pieces. After the fryer **10**T (PT) is packaging, freezing, handling and so on.

(30) So the core of the food process line **20** is typically built starting at the end, the fryer **10**T (PT), and then progresses from there which is the upline direction.

(31) There is always the risk that with too few of workers to roll these machines **100** around, there is the greater risk that a machine **100** may gain too much momentum and get away from the workers, and perhaps collide into the downline machine **100** it is being parked against, and damage both machines **100**.

(32) So the assembly/re-assembly of the line **20** always poses the potential for collision damage. It is an object of the invention to park adjacent machines **100** relative to each other by automated control provisions, or else powered assist provisions, but at least by passive docking and parking guide tracks (eg., reference numeral **201** in FIGS. **3**-**7**, reference numeral **202** in FIG. **8**, reference numeral **203** in FIG. **9**, reference numeral **204** in FIG. **11**).

(33) FIG. **2** shows that this food process machine (eg., a drum-tumbling dry coating machine **10**D, or SF in FIG. **1**B) comprises a box-like cabinet **34** built on a box-like frame **36**, with four caster wheels **30** at each bottom corner of the cabinet **34**. FIG. **5** shows that the cabinet **34** includes a bottom wall **38**, and that a servo motor **42** mounted inside the cabinet **34** and on this bottom wall **38**. The servo motor **42** is mounted vertically and its drive shaft **44** projects down through the bottom wall **38** and carries the slowly-driven gear-toothed router wheel **46** that is suspended off the factory floor **32** by some small gap.

(34) Mounted stationary on the factory floor **32** is a rack track **201** (also referred to as any of

channel, slot, guide rail path or pathway and so on). The machine **10**D (SF) is manually wheeled until the slowly-driven gear-toothed router wheel **46** engages the gear-toothed sidewall **52** of the track **201**. The electric power supplied to the machine **10**D for its tumbling operations can also power the servo motor **42**. The onboard power and an onboard control system **54** may drive the slowly-driven gear-toothed router wheel **46** and automatically take over the final few centimeters of docking and parking the machine **10**D into the preferred position for it.

(35) To return briefly to FIGS. **1**A and/or **1**B, the machines **100** of the food process line **20** are disassembled from the rear, beginning with the loader(s) **10**S and/or forming machines **10**Z. Several of the machines **100** have inflow or discharge conveyor noses **56** and **58** that project into the preceding (upline) or succeeding (downline) machine **100**. So the machines **100** have to be backed out and/or the respective conveyor noses **56** and **58** raised up or retracted to disassemble the line **20**.

(36) FIGS. **4** and **6** show that this track **201** (or channel and so on) is non-linear in part. The left (downline) half **62** of the track **201** is linear and aligned on (or parallel to) the central lineal axis **64** (of near symmetry) of the automatic and/or mechanized food-process line **20** after assembly. FIG. **4**, as well as FIGS. **7**A through **7**B, provide a designation for this central lineal axis **64** (of near symmetry) for the automatic and/or mechanized food-process line **20**. To return to FIGS. **4** and **6**, the right (upline) half **66** of the track **201** is curved outboard from the lineal axis **64** (down in FIG. **4** and down and right in FIG. **6**).

(37) The track **201** comprises a pair of spaced sidewalls **52** and **72**, defining a main aisle **74** (channel or slot) equidistantly spaced apart for the most part, except at the opposite open ends **76** and **78** where the sidewalls **52** and **72** flare apart to form a funnel-shaped entrance **76** or **78** for the main aisle **74** of the track **201**. One sidewall **52** is formed with teeth which are engaged by the slowly-driven gear-toothed router wheel **46** and hence it is the “rack” (gear-tooth formed) sidewall **52**. The other sidewall **72** is preferably featureless (smooth) and serves as a cam surface engaged by the undriven cam roller wheel **82**, and for the purpose of forcing the slowly-driven gear-toothed router wheel **46** to remain in engagement with the gear-tooth formed sidewall **52**.

(38) In use, the drum-tumbling dry coating machine **10**D will be wheeled manually by a team of workers until the slowly-driven gear-toothed router wheel **46** enters the funnel of the outboard-facing funnel entrance **76**. After the slowly-driven gear-toothed router wheel **46** is directed into the funnel entrance **76** and reaches the throat **84**, the servo motor **42** can be switched ON. As the slowly-driven gear-toothed router wheel **46** gains traction on the rack (gear-toothed formed) sidewall **52**, the slowly-driven gear-toothed router wheel **42** provides assistance if not takes over the final centimeters of docking and parking the drum-tumbling dry coating machine **10**D relative to a succeeding (downline) machine (which in FIG. **1**B could be PF pivoting transfer conveyor **10**X or BP the batter coating machine **10**W).

(39) The bottom wall **38** of the drum-tumbling dry coating machine **10**D further provides the mounting of depending vertical shaft **86** carrying the undriven cam roller wheel **82**. This undriven cam roller wheel **82** is mounted to interact with the featureless (smooth) sidewall **72** and, cooperatively with the slowly-driven gear-toothed router wheel **46**, true up the axial alignment of the drum-tumbling dry coating machine **10**D in the linear portion **62** of the track **201**. Again, the alignment is preferably centered on (or parallel to) the central lineal axis **64** (of near symmetry) for the automatic and/or mechanized food-process line **20**.

(40) Disassembly can be managed in a variety of ways. FIGS. **5** and **10** show that the slowly-driven gear-toothed router wheel **46** and the undriven cam roller wheel(s) **82** can be manually disengaged from the track **201** (or **203**) by pulling them up and out of the slot **201** (or **203**). Now the respective machine **100** can roll freely, free of any constraint of the track **201** (or **203**).

(41) Alternatively, the slowly-driven gear-toothed router wheel **46** and the undriven cam roller wheel(s) **82** can be left engaged. And with disassembly, the servo-motor **42** would initiate the reversing of machine **10**D (SF) away from (or out of) the succeeding (downline) machine **100**,

providing a straight reverse path to avoid damage to either of the machines **100**.
(42) FIG. **7**A is a top plan schematic view of a line **20** of three machines **100** in series. The left (downline) machine **100** is racked and aligned in the preferred alignment for it. The right (upline) machine **100** is a little backed away from its preferred final location but at least is aligned centered on (or parallel to) the central lineal axis **64** (of near symmetry) for the automatic and/or mechanized food-process line **20**. The center machine **100** is undergoing a distinctly different maneuver. The center machine **100** is in the process of making a docking or parking maneuver from approaching from an outside five o'clock position on an imaginary clock dial in FIG. **7**A. Workers would manually roll the machine **100** on its caster wheels to the position shown in FIG. **7**A.
(43) FIG. **7**B is a top plan schematic view comparable to FIG. **7**A except showing the center machine **100** half through a pivot from the outside five o'clock position on the imaginary clock dial (eg., FIG. **7**A) to about an alignment on a four o'clock to ten o'clock axis on the imaginary clock dial. The servo motor **42** and slowly-driven gear-toothed router wheel **46** would take over the maneuvering from this stage.
(44) FIG. **7**C is a top plan schematic view comparable to FIG. **7**B except showing the center machine **100** racked and aligned in the preferred alignment for it. The center machine **100** is oriented on a three o'clock to nine o'clock axis, parallel with (or preferably centered on) the longitudinal axis **64** of near symmetry of the automatic and/or mechanized food process line **20**. Again, the servo motor **42** and slowly-driven gear-toothed router wheel **46** would take over the responsibility of maneuvering the center machine **100** from the position shown in FIG. **7**B to the position shown in FIG. **7**C.
(45) In FIGS. **7**A through **7**C, it can be appreciated that the linear (straight) section **62** of the track **201** can be made relatively longer or shorter to accommodate machines **100** of different length. Alternatively, the linear section **62** of the track **201** can be extended as necessary by laying new track.
(46) FIG. **7**A shows the downline most machine **100** (the left machine) is in its preferred parking spot by observing that the slowly-driven gear-toothed router wheel **46** is in the fore-to-aft middle of the linear section **62** of its respective track **201**. However, the upline most machine **100** (the right machine) is not. It can be observed that the undriven cam roller wheel **82** has just barely made the turn of the arcuate section **66** and sits at the rear of the straight section **62**.
(47) The reason for this, as shown in FIG. **7**B, is it allows the center machine **100** to pivot without swiping either the machine **100** downline from it or the machine **100** upline from it.
(48) In FIG. **7**C, the upline most machine **100** (the right machine) has been advanced further in its track **201**'s straight section **62** to close the gap with the center machine **100**. In other words, the straight (linear) sections **62** of the tracks **201** allow a little adjustment of machine position both to provide gaps during pivot maneuvers as well as close the gaps for food process line **20** run times.
(49) To return to FIGS. **5** and **6**, this first embodiment of a track **201** in accordance with the invention comprises a pair of spaced sidewalls **52** and **72** standing up off a mounting plate **88** by means of a fence-like row of spaced posts **92**. The mounting plate **88** is then positioned on the factory floor **32** at planned locations, certainly with surveying-equipment exactness. The slowly-driven gear-toothed router wheel **46** and the undriven cam roller wheel **82** are mounted at the end of respective shafts **44** and **86** which are respectively mounted to mounting hardware in mounted to the bottom sidewall **38** of the cabinet **34** of the machine **100**. The slowly-driven gear-toothed router wheel **46** and the undriven cam roller wheel **82** are mounted so that they have vertical strokes. In FIG. **5**, the slowly-driven gear-toothed router wheel **46** and the undriven cam roller wheel **82** as drawn in solid lines are at their vertically downward extreme, which can be reckoned as the “engagement” elevation. But they can be elevated up, so that the elevation the slowly-driven gear-toothed router wheel **46** is shown in broken lines, is the “disengaged” elevation.
(50) FIG. **8** is a perspective view comparable to FIG. **6** except of a second embodiment of a track **202** in accordance with the invention and an associated router member **210** for cooperating with the

track **202** (eg., the router member **210**'s route/transit being guided and constrained by the track **202**). However, in this embodiment, the router member **210** is a fixed protrusion standing up off the factory floor **32**, and moreover it is just a static protrusion **210** (eg., it is a peg or stylus). It does not spin. Furthermore, as just mentioned, in this embodiment the router structure **210** stands up off the factory floor **32** (rather than being suspended from the bottom wall **38** of any food-process line **20** machine **100**). And in a swap of positions, the track **202** is affixed to the bottom wall **38** of the food-process line **20** machine **100** (and does not stand up off the factory floor **32**).

(51) This FIG. **8** embodiment of track **202** and router member **210** is an economically suitable accommodation for lighter weight machines (eg., **10**X) of any of the assortment of machines **100** that might form an automatic and/or mechanized food-process line **20**. In FIG. **1**B, machine PF (**10**X) would be for example and without limitation a transfer conveyor PF (**10**X).

(52) Before discussing FIG. **8** much further, some preliminaries are due about these kind of food process lines **20** in general.

(53) These food process lines **20** are composed of a string of machines **100** lined up (aligned) in series in an actual “line.” Each machine **100** is typically specially designed for a distinct operation or set of operations.

(54) The machines **100** handle food products fit for human consumption including without limitation chicken, fish, seafood, pork, beef and so on (eg., chicken tenders, chicken nuggets, shrimp tails, and on and on and on). These food process lines **20** are loaded with (what typically are) raw food product pieces at an intake end, convey the pieces through a series of coating operations, then further convey the coated food product pieces through a hot oil bath fryer **10**T which more or less par-fries the food product pieces sufficient to set the coatings. The food product pieces are then frozen, packaged and shipped to remote destinations. Before human consumption, the frozen food product pieces will be cooked to a final specified condition (eg., deep-fried, or thawed and baked, and so on) to complete the food product for consumption.

(55) In these food process lines **20**, most if not all of these machines **100** will have endless conveyor belts (eg., portions indicated as nose end **56** and **58**) receiving the food product pieces at an intake end **56** for that machine **100**, and discharging the food product pieces from ‘that’ machine **100** to a downline machine **100**. Thus the dividing partition between each machine **100** in the line **20** is typified by a transfer operation. In FIG. **1**B, some machines **100** both perform a coating operation and transfer the food product pieces directly to a succeeding downline coating machine **100**. In other places, two machines will be separated by a transfer conveyor PF (**10**X) which does the job. The transfer conveyor **10**X might combine other functions like weighing functions, flowrate adjustment operations, compensate for elevational differences and more.

(56) For the majority of the machines **100**, the internal conveying functions are handled by stainless wire mesh endless belts typified by an upper food-product carrying run and a lower return run. In fewer cases (eg., a coating machine that handles Panko crumb), the endless belt of the main conveyor through the Panko coating machine comprises a web of solid material, and preferably the solid web material comprises food grade conveyor belt reinforced with KEVLAR® cord.

(57) For the purposes of the present invention, machines **100** in these kinds of food process lines **20** can be broadly classed into three categories (again, these categories are not any industry standard, they are just categories based broadly on weight, complexity of function and immovability): A. the fryer **10**T; B. transfer conveyors **10**X, side cars, other lightweight adjuncts; and C. everything in between.

(58) The term “side car” is by no means not any term of art, but here merely gives a name to the many special-function side adjuncts that many of the machines are accompanied by. These side carts are wheeled separately about on their own casters **30** (or roller feet). A dry coating machine **10**D will have a side car comprising a hopper of make-up dry coating material (ie., to replenish the dry coating machine **10**D after so much dry coating material has been carried away by the intake of uncoated food product and discharge of dry-coated food product). Similarly for a batter machine

**10**W, it will have a side car comprising a hopper of dry batter mix (which will be mixed with water inside the batter machine **10**W to make the wet coating). Perhaps other side cars are to collect debris, like with the hot oil bath fryer **10**T which may produce fried hard pieces of coating material alone with no meat in the core. There is a continuous production of both floating debris and sinking debris in the fryer **10**T. That debris is skimmed or collected and transferred out the frying oil bath and transferred over to a collection bin, for ultimate disposal later. That collection bin for that debris is such a side car.

(59) All these machines **100** reside in a factory (eg., a food process line **20** production plant). The factory has a factory floor **32** typically comprising a concrete slab coated in any of numerous USDA-approved floor coatings. The floor **32** is generally flat but there will be a distribution of other features like floor drains or drain channels, and perhaps some local shallow slope proximate the floor drains or drain channels.

(60) Utilities like for example and without limitation electric power, water, thermal oil service for the fryer, or alternatively combustible fuel for the fryer, will typically brought in from overhead or at least over the ground plane of the floor **32**.

(61) It is in this environment that such food process lines **20** are formed, run, and then disassembled for cleaning, maintenance, reassembled/re-configured and run again. So again to return the three broad classes of machines:

(62) A. The Hot Oil Bath Fryer **10**T.

(63) The improvements in accordance with the invention are not readily expected to benefit hot oil bath fryers **10**T. Hot oil bath fryers **10**T are long, heavy, plumbed with a lot of utility connections. Hot oil bath fryers **10**T are not usually (not ever?) mounted on casters or roller feet **30**. During use, the hot oil bath fryer **10**T will have a full bath of hot frying oil. During cleaning, that will be drained, but the hot oil bath fryer **10**T will typically also have a full fluid circuit of a circulating thermal fluid. Frying oil these days is predominately any of a number of vegetable-based cooking oils, most which can be found in a home kitchen (whereas fat or lard and the like have long fallen out of disfavor). Thermal oil is more akin to engine oil. It is not suitable for human consumption.

(64) During cleaning, the thermal oil will not be drained. The thermal oil circuit itself and its connections are typically hardwalled steel channels or pipe. The hot oil bath fryer **10**T has two endless conveyor belts extending nearly its entire length, one over the other. The upper endless conveyor is a submerger conveyor belt. The hot oil bath fryer **10**T has a hood not just to contain fumes but to provide a barrier and safety to workers. The hot oil bath fryer **10**T moreover has a full cabinet which when closed again provides a barrier and safety to workers from hot components, as well as provides some insulation. In part the insulation helps contain thermal loss and thus perhaps makes the hot oil bath fryer more efficient. In other part, the insulation reduces thermal pollution in the indoor factory environment for the comfort of workers as well as not to spoil food or coating material products also sharing the same the indoor factory environment (“room”) as the hot oil bath fryer **10**T.

(65) In sum, the hot oil bath fryer **10**T is so different because it is so big, heavy, complex and immobile that is more or less the fixed head of the line **20** on the factory floor **32** from which the more mobile machines **100** are formed in a line **20** as a tail.

(66) B. The Transfer Conveyor **10**X.

(67) The transfer conveyor **10**X (PF in FIG. **1**B) sits at the opposite end of the spectrum of weight and mobility. The transfer conveyor **10**X can be wheeled around with ease perhaps by only one worker. The transfer conveyor **10**X lacks a cabinet (since such is essentially needless) and is more or less a bare legged cart, rolling on casters **30**.

(68) The second embodiment of a track **202** and associated router member **210** in accordance with the invention, and as shown by FIG. **8**, is a good match for a transfer conveyor **10**X. The router member **210** here is fixed (eg., it is a peg or stylus), and moreover it is fixed relative to the factory floor **32**. The router member **210** (peg or stylus) is fixed directly to a mounting plate **212** and the

mounting plate **212** is fixed directly to the factory floor **32**. Whereas FIG. **8** shows mounting plate **212** fastened to the factory floor **32** by fasteners into the concrete slab, alternatively and preferably the mounting plate **212** is affixed by adhesive. The track **202** is affixed to some low elevation structure of the transfer conveyor **10**X (or bottom wall **38** of a food-process line **20** machine **100** that has a cabinet **34**). The track **202** comprises a pair of arcuate featureless (smooth) sidewalls **214** evenly spaced apart from one another to make pathway **74** for guiding the router member **210**. The track **202**'s sidewalls **214** form a funnel section **216** and an entrant section **224** for the process of making a docking or parking maneuver from approaching from an outside five o'clock position on an imaginary clock dial like shown in FIG. **7**A. The track **202**'s sidewalls **214** form a linear section **226** racked for aligning the associated machine **100** (eg., transfer conveyor **10**X) in the preferred alignment for it, oriented on a three o'clock to nine o'clock axis of the imaginary clock dial of FIGS. **7**A-**7**C, parallel with (or preferably centered on) the longitudinal axis **64** of near symmetry of the automatic and/or mechanized food process line **20** like shown in FIG. **7**C.

(69) C. Every Other Kind of Machine Between A. And B.

(70) To go back to making general comments about these kind of food process lines **20**, the machines **100** in this residuary Class C. are characterized by being too heavy for one worker to handle alone. These residuary Class C. are characterized by having cabinets **34**. The cabinets **34** partition the machine **100** into at least two interior spaces. There is typically an upper through-flow channel through which food product pieces flow from the intake end **56** to the discharge end **58**. Along the way, the food product pieces are subjected to some operation or pick up some form of coating. A non-coating operation may be for example and without limitation an operation searing in grill marks on beef patties or the like.

(71) But if the operation is a coating operation, part of the function of the cabinet **34** is to confine the wafting or slinging about of the coating material inside the upper flow-through channel. Hoods are included to further assist in confining the wafting or slinging about of the coating material inside the upper flow-through channel. The rest of the cabinet **34** comprises perhaps a lower utility space for a motor **42** or motors, gears or transmissions that preferably closes tight enough to combat intrusion of the debris in the form of its own coating material, or the coating material of companion machines. Wheat flour, among other coating materials, can quickly gum up an electric motor or the meshing effectiveness of a pair of gears. The cabinet **34** further partitions the cabinet housing as a whole into various smaller or pocket-sized spaced as for control systems **54** and other electronics.

(72) FIG. **9** shows of a third embodiment of a track **203** in accordance with invention and an associated slowly-driven gear-toothed router wheel **46** in accordance with the invention, which is furthermore complimented by (flanked between) a pair of cam roller wheels **82**. During parking or docking maneuvers the slowly-driven gear-toothed router **46** would engage the toothed sidewall **52** of the track **203** and the cam roller wheels **82** would engage the featureless (smooth) sidewall of the track **72**. FIG. **10** is a top perspective view of FIG. **9** to show better that the cam roller wheels **82** are mounted at the bottom of shafts **86** which have upper ends mounted at the outer ends of spring-biased arms **232**. The arms **232** pivot about pivot axes through the inner ends of the arms **232** to induce (a) the cam roller wheels **82** to stay engaged with the featureless (smooth) sidewall **72** and (b) the slowly-driven gear-toothed router wheel **46** to stay engaged with the gear-tooth formed sidewall **52**.

(73) The cam roller wheels **82** are spaced flanking the slowly-driven gear-toothed router wheel **46**, wherein one cam roller wheel **82** leads and the other cam roller wheel **82** trails. The slowly-driven gear-toothed router wheel **46** and dual cam rollers wheels **82** make three points of contact with the track **203**. This three point contact better trues up the alignment of the associated machine **100** for orientation on a three o'clock to nine o'clock axis of the imaginary clock dial of FIGS. **7**A-**7**C, parallel with (or preferably centered on) the longitudinal axis **64** of near symmetry of the automatic and/or mechanized food process line **20** like shown in FIG. **7**C.

(74) Alternatively, the pivoting of the arms **232** may be mechanically driven by a drive source as well. The drive sources could be independent servo-motors. The purpose of driving the arms **232** is not to propel the associated machine **100** with forward or rearward movement with respect to the track **203**. Rather, the arms **232** are driven so that the arms **232** will yield better to the machine **100** making the turn in the track **203** (eg., like in FIG. **7**B) but then rigidly force the machine **100** to orient parallel with the process line **20** axis **64** as shown in FIG. **7**C.
(75) FIG. **11** shows of a fourth embodiment of a track **204** in accordance with invention, comprising a monorail track **204** in contrast to slots or channels shown previously, and an associated slowly-driven gear-toothed router wheel **46** in accordance with the invention furthermore complimented by a pair of cam roller wheels **82**. As described comparably before, during parking or docking maneuvers (a) the slowly-driven gear-toothed router wheel **46** to stays engaged with the gear-tooth formed sidewall **242** of the monorail track **204** and (b) the cam roller wheels **82** stay engaged with the featureless (smooth) sidewall **244** of the monorail track **204**.
(76) And further as comparably described before, the cam roller wheels **82** are spaced wherein one cam roller wheel **82** is relatively ahead of the slowly-driven gear-toothed router wheel **46** in the fore to aft direction and the other cam roller wheel **82** is relatively trailing the slowly-driven gear-toothed router wheel **46** in the fore to aft direction. That way, the slowly-driven gear-toothed router wheel **42** and dual cam rollers wheels **82** make three points of contact with the monorail track **204**. This three point contact better trues up the alignment of the associated machine **100** for orientation on a three o'clock to nine o'clock axis of the imaginary clock dial of FIGS. **7**A-**7**C, parallel with (or preferably centered on) the longitudinal axis **64** of near symmetry of the automatic and/or mechanized food process line **20** like shown in FIG. **7**C.
(77) The invention having been disclosed in connection with the foregoing variations and examples, additional variations will now be apparent to persons skilled in the art. The invention is not intended to be limited to the variations specifically mentioned, and accordingly reference should be made to the appended claims rather than the foregoing discussion of preferred examples, to assess the scope of the invention in which exclusive rights are claimed.

## Claims

1. An improvement for automatic or mechanized food-process lines comprising numerous separate machines that are formed up to make an automatic or mechanized food-process line for food process production in a the food process factory having a factory floor; said improvement being in racking and alignment provisions for assembling, dis-assembling and then re-assembling the numerous separate machines that are formed up to make the automatic or mechanized food-process line for food process production in the food process factory; said racking and alignment provisions being adapted for at least one food process line machine that wheels about on casters or roller feet, whereby to guide the at least one food process line machine into a preferred alignment during assembling and re-assembling the line; and comprising any of: a transfer conveyor; a dry coating machine; a wet coating machine; coating machines of other natures including Panko crumb coating machines; machines performing non-coating, cosmetic operations; said improvement comprising: said at least one food process line machine having a low elevation mounting structure spaced above the factory floor by a low gap; a track attached to or affixed relative to either the low elevation mounting structure of the at least one food process machine or the factory floor, but not the other; and a router provision attached to or affixed relative to the other of the low elevation mounting structure or the factory floor for being guided by the track.
2. The improvement of claim 1, wherein: the track comprises one rail that has one sidewall formed with gear teeth; and the router provision comprises a slowly-driven gear-toothed router wheel for engaging the gear-formed sidewall of the rail.
3. The improvement of claim 2, wherein: the track further comprises a spaced other rail; and the

improvement further comprises a cam roller wheel mounted cooperatively with the slowly-driven gear-toothed router wheel wherein the cam roller wheel and slowly-driven gear-toothed router wheel mutually induce each other such that the cam roller wheel stays engaged with the other rail and the slowly-driven gear-toothed router wheel to stay engaged with the gear-tooth formed sidewall of the one rail.

4. The improvement of claim 2, wherein: a rail further comprises a second sidewall such that the rail has a thickness between the one sidewall formed with gear teeth and the second sidewall; and the improvement further comprises a cam roller wheel mounted cooperatively with the slowly-driven gear-toothed router wheel wherein the cam roller wheel and slowly-driven gear-toothed router wheel mutually induce each other such that the cam roller wheel stays engaged with the second sidewall and the slowly-driven gear-toothed router wheel stays engaged with the gear-tooth formed sidewall.

5. The improvement of claim 4, further comprising: a second cam roller wheel mounted cooperatively with the slowly-driven gear-toothed router wheel and one cam roller wheel wherein the one and second cam roller wheels and slowly-driven gear-toothed router wheel mutually induce each other such that the one and second cam roller wheels stay engaged with the second sidewall and the slowly-driven gear-toothed router wheel stays engaged with the gear-tooth formed sidewall.

6. The improvement of claim 5, wherein: the food process line defines a lineal axis extending from an upline direction to a downline direction, or vice versa; the rail has a lineal section which during food process line run operations is aligned with or parallel the lineal axis of the food process line; and the router wheel is flanked between the one and second cam rollers in the upline to downline direction, or vice versa.

7. The improvement of claim 6, wherein: the rail is elongated between a relatively upline entry end and a spaced relatively downline other end; the rail further comprising an arcuate section that curves outboard from the lineal section and terminates in the entry end whereby food process line machines make a side entry inbound trip to assembly and alignment by virtue of the arcuate section and then the lineal section, or else, side disassembly outbound trip by virtue of the lineal section and then the arcuate section.

8. The improvement of claim 7, wherein: the track is attached to or affixed relative to the factory floor; and the router is provision attached to or affixed relative to the low elevation mounting structure of the at least one food process machine.

9. The improvement of claim 7, further comprising: a second track attached to or affixed relative to either the low elevation mounting structure of a second food process machine or the factory floor, but not the other; and a second router provision attached to or affixed relative to the other of the low elevation mounting structure of the second food process line machine or the factory floor for being guided by the second track.

10. The improvement of claim 3, further comprising: a second cam roller wheel mounted cooperatively with the slowly-driven gear-toothed router wheel and one cam roller wheel wherein the one and second cam roller wheels and slowly-driven gear-toothed router wheel mutually induce each other such that the one and second cam roller wheels stay engaged with the spaced other rail and the slowly-driven gear-toothed router wheel stays engaged with the gear-tooth formed sidewall of the one rail, whereby the spaced rails define an aisle therebetween.

11. The improvement of claim 10, wherein: the food process line defines a lineal axis extending from an upline direction to a downline direction, or vice versa; the aisle has a lineal section which during food process line run operations is aligned with or parallel the lineal axis of the food process line; and the router wheel is flanked between the one and second cam rollers in the upline to downline direction, or vice versa, when all are occupying the lineal section of the aisle.

12. The improvement of claim 11, wherein: the aisle is elongated between a relatively upline entry end and a spaced relatively downline other end; the aisle further comprising an arcuate section that curves outboard from the lineal section and terminates in the entry end whereby food process line

machines make a side entry inbound trip to assembly and alignment by virtue of the arcuate section and then the lineal section, or else, side disassembly outbound trip by virtue of the lineal section and then the arcuate section.

13. The improvement of claim 12, wherein: the track is attached to or affixed relative to the factory floor; and the router provision is attached to or affixed relative to the low elevation mounting structure of the at least one food process machine.

14. The improvement of claim 12, further comprising: a second track attached to or affixed relative to either the low elevation mounting structure of a second food process machine or the factory floor, but not the other; and a second router provision attached to or affixed relative to the other of the low elevation mounting structure of the second food process line machine or the factory floor for being guided by the second track.

15. The improvement of claim 12, wherein: the spaced rails proximate the entry end of the aisle flare away to form a funnel shaped throat at the entry end.

16. The improvement of claim 12, wherein: the router provision is mounted stationary relative to either the low elevation mounting structure of the food process line machine or the factory floor; the one and second cam rollers are mounted on respective arms that mounted to either the low elevation mounting structure of the food process line machine or the factory floor mutually with the router provision; the arms are furthermore mounted to yield the respective one or second cam roller during the turn in the arcuate section whereby thereafter true up the alignment and assembly of the food process line machine in the lineal section of the aisle.

17. The improvement of claim 1, further comprising: a second track attached to or affixed relative to either the low elevation mounting structure of a second food process machine or the factory floor, but not the other; and a second router provision attached to or affixed relative to the other of the low elevation mounting structure of the second food process line machine or the factory floor for being guided by the second track.

18. The improvement of claim 1, further comprising: a plurality of tracks attached to or affixed relative to either the low elevation mounting structure of a plurality of food process machines or the factory floor; and a plurality of router provisions attached to or affixed relative to the other of the low elevation mounting structure of respective ones of the plurality of food process line machines or the factory floor for being guided by the respective track therefor.

19. The improvement of claim 18, wherein: the tracks are attached to or affixed relative to the factory floor at spaced locations relative to the lineal axis of the food process line; and the router provisions are attached to or affixed relative to the low elevation mounting structure of the respective one food process machine.

20. The improvement of claim 19, wherein: the tracks comprises at least one rail that has one sidewall formed with gear teeth; the respective router provisions each comprises a slowly-driven gear-toothed router wheel for engaging the gear-formed sidewall of the respective guide rail; and each respective food process line machine further comprises a servo motor whereby for driving the respective slowly-driven gear-toothed router wheel.