

Method and Apparatus for Forming Creases on a Piece of Dough

Field of the Invention

This invention relates to a method and an apparatus for forming creases in the top surface of a piece of food material (dough) that has a roughly spherical top, such as a Chinese bun or other types of buns, and in particular to such a method and an apparatus that allows the creases formed in the piece of dough to remain after it is processed to be a final product.

Description of the Prior Art

In one conventional method to form creases in the top surface of a piece of dough such as a Chinese bun or other types of buns, a die is pressed against the bun to form grooves and hence creases. However, when the bun that has creases (or grooves) at the top formed by that method is subjected to a process such as one of fermenting or steaming, the walls of the grooves droop and the creases almost disappear. Thus, generally the creases are manually formed for a Chinese bun, etc.

To form creases in the spherical top surface of a piece of dough by using a machine has been proposed, as in prior-art publications JP, B, H3-72268 and JP, B, 2761855.

In the first publication, JP, B, H3-72268 (prior-art publication No. 1), a plurality of forming plates that reciprocate radially have inner ends. Each of the inner ends has a crease-forming portion curved in the direction in which a crease to be formed on a piece of dough is twisted. The plurality of forming plates are radially advanced into the piece of dough that is located at the central position surrounded by them so that the crease-forming portions trench (i.e., form grooves in) the top surface of the piece of the dough at positions spaced apart by a predetermined distance from the center of the surface of the top, twisting the periphery of the top to form eddy-shaped creases. Further, a vertical shaft, which has a small diameter, contacts and horizontally rotates the top to twist the creases.

Accordingly, in prior-art publication No. 1 twisted creases are formed in the top surface of the piece of dough, and these creases can remain in the final product. However, since the device of prior-art publication No. 1 needs a structure for reciprocating the plurality of forming plates and a mechanism for allowing the vertical shaft to contact and twist the top of a

piece of dough, it is relatively complicated. Thus this problem of the device should be improved.

5 In the second publication, JP, B, 2761855 (prior-art publication No. 2), a plurality of supporting rods are disposed on an imaginary circle such that they are spaced equally and face in tangential directions of the circle. Bell cranks, each having a crease-forming plate at its lower portion, are pivotably mounted on the supporting rods such that their crease-forming plates reciprocate radially when the bell cranks oscillate. The lower end portion of each crease-forming plate is shaped as a curved or bent plate, forming a shearing blade. The crease-forming edges of these shearing blades trench the top surface of the piece of dough to form an embossed pattern in the surface.

10 In prior-art publication No. 2 each bell crank oscillates in the vertical plane in which the vertical centerline of the centered piece of dough lies. Accordingly, if the crease-forming plates were in the form of simple flat plates, they would form simple straight grooves in the surface of the piece of dough when they advance radially inward into the surface. Thus, to form the curved creases in the surface, the lower end portion of each crease-forming plate is formed as a bent or curved shearing blade such that the crease-forming edge of it is shifted from the vertical plane in which the vertical centerline of the piece of dough lies, and the bell crank moves reciprocatingly.

20 Thus, in prior-art publication No. 2 the crease-forming plates shape the grooves for forming the creases. Further, each of the bell cranks changes its position from an inclined one to a vertical one during its oscillation, and each of the crease-forming plates is lowered due to the oscillation. Thus when the crease-forming plates form the creases (grooves) on the piece of dough, they tend to press it downward and hence collapse or deform it. This disadvantage should be improved.

30 Generally, when creases are formed in the top surface of a bun, for example, a Chinese bun or other type of bun that has a roughly spherical top, some crease-forming plates trench a food material (a piece of dough) toward its center, forming grooves in its surface. These formed grooves are perpendicular to the planes that are tangential to the surface of the piece of dough at the points on the surface where the crease-forming plates contact it, since the crease-forming plates trench it in the direction perpendicular to the tangential plane from the periphery of the piece of

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dough toward its center.

If such grooves are formed substantially perpendicularly to the surface of a piece of dough, as in the above case, the walls of the grooves would droop after it is subjected to a fermenting or steaming process or the like to become a final product, and hence the creases would almost disappear in the final product.

Summary of the Invention

However, if the crease-forming plates trench the roughly spherical top surface of a piece of dough such that they peel the skin of the piece of dough, and such that grooves are formed slantwise to the top surface of the piece of dough, each of the peeled surface portions, which have been angled with respect to the remaining part of the piece of dough at the formed grooves, become a projection that has an end formed in an acute angle. This projection that is provided with an acute end tends to remain after the piece of dough is subjected to a fermenting or steaming process or both to be a final product.

This invention has been conceived in view of the disadvantages of the prior art and the above tendency in that the projection provided with an acute end remains in the final product.

In one aspect of the method of the present invention for forming creases in a roughly spherical top surface of a piece of dough, the method comprises allowing a plurality of plates for forming the creases in the roughly spherical top surface to trench the top surface in a direction such that the top surface is peeled, and such that projections formed of the peeled portions of the top surface gradually become thicker as peeling proceeds, thereby forming a distal end of each projection that projects at an acute angle.

In the above aspect of the invention the projections may be pressed between adjacent plates for forming creases so that the projections, which consist of the peeled portions of the top surface of the piece of dough, become more acute.

In another aspect of the apparatus of the present invention for forming creases in a roughly spherical top surface of a piece of dough, the apparatus comprises a plurality of rotary shafts rotatable reversibly, the rotary shafts being spaced equally on an imaginary circle located above a piece of dough that is placed in a predetermined position; and levers extending downward, each lever having a crease-forming portion at its lower end and being secured,



for rotation, to the corresponding rotary shaft, the levers being inclined so that the planes along which the levers move when rotated by the rotary shafts define an upside-down polygonal cone, and so that when the levers rotate, the crease-forming portions of the levers trench the piece of dough in a direction
5 such that the top surface is peeled, and such that projections formed of the peeled portions of the top surface gradually become thicker as the peeling proceeds.

In the above aspect of the apparatus of this invention the rotary shafts may extend outward and downward so that the distal end of each rotary shaft
10 faces away from the centerline of the imaginary circle, and each lever is secured to its corresponding rotary shaft so that the lever is inclined inward when the distal end of the lever approaches the centerline of the imaginary circle.

Brief Description of the Drawings

15 Fig. 1 is a front view of the embodiment of the device for forming creases of the present invention.

Fig. 2 is a fragmentary sectional side view of the embodiment shown in Fig. 1.

Fig. 3 is a front view of the reversibly rotatable levers of the
20 embodiment, showing the levers being opened.

Fig. 4 is a bottom view of the opened levers.

Fig. 5 is a side view of two opened levers, wherein for a clear view all other levers are omitted.

Fig. 6 is a side view of the two levers, which are closed.

25 Fig. 7 is a bottom view of all levers, which are closed.

Description of the Preferred Embodiment

In Figs. 1 and 2, the device 1 for forming creases of the present invention is located in a position adjacent to a machine 3 for producing a food product, such as an encrusting machine. The food-producing machine 3 is to
30 produce food materials (pieces of dough) 5 such as Chinese buns or other types of buns, each of which has a roughly spherical top. Since this kind of a food-producing machine is well known, the details of its structure and function are omitted.

The crease-forming device 1 is to form creases in the top surface of a
35 piece of dough 5, which is produced by the food-producing machine 3. In this

embodiment the crease-forming device 1 is mounted on a supporting bracket 7, which is in turn attached in parallel to a side of the food-producing machine 3. The supporting bracket 7 is disposed adjacent to the back of a transfer conveyor 9 such as a belt conveyor that conveys the pieces of dough 5, which are produced by the food-producing machine 3, to a place where they are subject to the following process. Namely, in Fig. 1 the supporting bracket 7 is disposed behind the conveyor 9 and in Fig. 2 on the left of it (in Fig. 2 the conveyor 9 is omitted, and a conveyor guide 21 is shown).

The supporting bracket 7 supports an upright supporting member 11, on the front wall of which member the crease-forming device 1 is mounted for vertical movement. In detail, a pair of vertically opposing brackets 13, 13 are mounted on the front wall of the supporting member 11, and they hold the upper and lower ends of a pair of upright guide bars 15, 15 (see Fig. 1). The upper and lower brackets 13, 13 also support an upright adjusting screw 19 provided with an adjusting knob 17 at its top such that the screw can reversibly rotate.

The guide bars 15, 15 support and guide a lifting frame 23, which is disposed above the conveyor guide 21. A nut member 25 secured to the lifting frame 23 engages with the adjusting screw 19, so that the lifting frame 23 moves vertically when the adjusting knob 17 rotates. Thus the vertical position of the lifting frame 23 can be adjusted.

A controlling motor 29 is mounted on the lifting frame 23, and a casing 27, which is in the form of a hollow cylinder, is secured to the bottom of the lifting frame 23. A drive gear 33 located within the casing 27 is secured to the output shaft 31 of the controlling motor 29. A plurality of rotary shafts 37, each provided with a driven gear 35 that meshes with the drive gear 33, are rotatably mounted on the casing 27.

The rotary shafts 37 are spaced equally on an imaginary circle having a centerline CL that corresponds to the axis of rotation of the output shaft 31. Each rotary shaft 37 is inclined such that its distal end faces downward and outward (i.e., in the direction away from the center or centerline CL of the imaginary circle). Namely, the inclined rotary shafts 37 are disposed on the inclined and upwardly-tapering outer surface of an imaginary cone that has the centerline CL.

Although in this embodiment the drive gear 33 is embodied as a bevel gear, and each driven gear 35 as a spur gear, the drive and driven gears may be spur and bevel gears, respectively, or both drive and driven gears may be

bevel gears. In short, any mechanism can be used as long as the inclined rotary shafts 37 can be rotated simultaneously.

A long lever 39 is secured, for reversible rotary movement (i.e., for oscillations), to the distal end of each rotary shaft 37. Each rotary lever 39 extends downwardly and perpendicular to the rotary shaft 37. Accordingly, as shown in Fig. 1, the orientation of the inclination of each rotary lever 39 becomes opposite that of the corresponding rotary shaft 37 when the rotary shafts rotate so that the distal ends of all rotary levers 39 join near the centerline CL. Namely, the lower ends of the rotary levers 39 reach the centerline CL when the rotary shafts 37 rotate, and the levers 39 are inclined such that the spatial area surrounded by the planes defined by the locus of the rotary levers when they rotate is an upside-down polygonal cone tapering downward.

Further, the lower end (distal end) of each rotary lever 39 has a crease-forming portion 41 for forming creases in the top surface of a piece of dough 5. The crease-forming portion 41 has a width that is greater than that of the remaining part of the lever and thus projects in the direction of the width. When the rotary shafts 37 rotate to join the lower portions of the rotary levers 39 at the centerline CL, the crease-forming portions 41 of the rotary levers 39 are located opposite their proximal ends with respect to the centerline CL, as shown in Fig. 1. Accordingly, as shown in Fig. 6, each crease-forming portion 41, which is formed at the lower portion of each rotary lever 39, trenches the top surface of the piece of dough 5 while being inclined, with the upper portions 41U of the crease-forming portions 41 being joined at the centerline CL, and their lower portions 41L being located away from the centerline CL.

In operating the crease-forming device 1 configured as explained above, first, the adjusting knob 17 is turned to adjust the vertical position of the device 1 relative to the size and height of the piece of dough 5, which is produced by the food-producing machine 3. The controlling motor 29 then operates to rotate the drive gear 33 and hence the rotary shafts 37 in the direction shown by the arrow A in Fig. 1, so that the rotary levers 39, which are located in their lower position as shown in Fig. 1, are rotated upward to their upper positions where they are opened upward and widely as shown in Figs. 3 and 4.

When one of the pieces of dough 5, which have been produced at the food-producing machine 3 and are now being transferred on the transfer

conveyor 9, is located under the crease-forming device 1, the conveyor stops, and the controlling motor 29 is rotated reversely to rotate the rotary shafts 37 in the direction shown by the arrow B in Fig. 1. Thus the rotary levers 39 are rotated from their upper positions shown in Fig. 5 to their lower positions, and the crease-forming portions 41 formed at the lower ends of the rotary levers 39 join at the centerline CL. Accordingly, as shown in Figs. 1 and 6, the crease-forming portions 41 trench the top surface of the piece of dough 5 slantwise and hence form creases in it.

Since the rotary shafts 37 are inclined, and since the rotary levers 39 vertically and reversibly rotate (oscillate) on the inclined planes, the crease-forming portions 41 trench the top surface of the piece of dough 5 in the directions shown conceptually by arrows C in Fig. 8 such that the top surface is peeled or chipped, and such that the projecting portions 43 resulting from the top surface being peeled or chipped by the crease-forming portions 41 gradually become thicker as the peeling or chipping proceeds, but not in the direction toward the center of the piece of dough 5. By trenching the piece of dough 5 by the crease-forming portions 41 in the direction such that the top surface of the piece of dough is peeled, each projecting portion 43, which is formed from a portion of the top surface of the piece of dough by peeling it, will have a distal (pointed) end formed in an acute angle.

Further, when the crease-forming portions 41 gradually close from their widely opened positions shown in Figs. 3 and 4 to their closed positions shown in Figs. 6 and 7, the anterior crease-forming portion 41, which trenches a part of the top surface of the piece of dough 5, functions to press down an adjacent part (projecting portion) 43 that is peeled and partially separated (and angled) by the posterior crease-forming portion 41, which is adjacent to the anterior crease-forming portion, i.e., it functions to constrain the projecting portion 43 from going too far forward. Thus the projecting portion 43 is effectively peeled and angled by the pair of adjacent crease-forming portions 41, 41.

As is understood from the above description, when alternate projections and depressions (namely, creases) are formed in the top surface of a piece of dough, this embodiment forms the creases by partially separating and angling the peeled projecting portions so that they have distal ends formed in an acute angle rather than just by forming grooves in the top surface. Thus the creases formed on the piece of dough always remain as in their original forms even in the final product, i.e., after the piece of dough is

subject to a process or processes such as ones of fermenting and steaming.

Although in the drawings each crease-forming portion 41 is shown in the shape of a flat plate, it may be in a desirable wedge-like shape provided with a wedge-like portion 45A at one side or wedge-like portions 45A, 45B at both sides as shown by imaginary (dotted) lines in Fig. 4. As the crease-forming portions, each being formed in a wedge-like shape, rotate and advance to join at the centerline CL, the adjacent pairs of them press harder the portions of the piece of dough pinched therebetween than when the wedge-shaped crease-forming portions are not used. Thus they can cause the peeled portions 43 to angle with respect to the remaining part of the piece of dough and to project at an acute angle and in a large length. Accordingly, the projecting portions will always remain in the final product.

The above embodiment is exemplary only, and the scope of the invention is not limited to it. Clearly, for one skilled in the art any other variation can be made without departing from the scope of the invention that is recited in the attached claims.

For example, in the above embodiment each rotary lever 39 is made of a straight flat plate and is provided at its distal end with a crease-forming portion 41 having a large width and a straight edge 41E (see Fig. 5) to trench a piece of dough 5. However, alternatively the edge 41E may be concave or convex, or in any other desirable shape. Further, the each rotary lever may be curved, or it may be made of a rod having a desirable diameter. When the rotary lever is made from a rod, it may be bent to have a desirable lever portion and a crease-forming portion.

Further, the crease-forming portion 41 may be coated with a fluoroplastic such as Teflon (trademark) to prevent the material of a piece of dough from adhering to the crease-forming portion, if to do so is desirable in considering the viscosity of the material of the piece of dough and the properties of the material of the crease-forming portion 41.



CLAIMS

1. A method of forming creases in a roughly spherical top surface of a piece of dough, comprising allowing a plurality of plates for forming the creases in the roughly spherical top surface to trench the top surface in a direction such that the top surface is peeled, and such that projections formed of the peeled portions of the top surface gradually become thicker as peeling proceeds, thereby forming a distal end of each projection so that the distal end projects at an acute angle.

2. The method of claim 1, wherein the projections are pressed between the adjacent plates for forming creases so that the projections formed of the peeled portions of the top surface of the piece of dough become more acute.

3. An apparatus (1) for forming creases in a roughly spherical top surface of a piece of dough (5), comprising: a plurality of rotary shafts (37) rotatable reversibly, the rotary shafts being spaced equally on an imaginary circle located above a piece of dough (5) that is placed in a predetermined position; and levers (39) extending downward, each lever having a crease-forming portion at a lower end thereof and being secured, for rotation, to the corresponding rotary shaft (37), the levers (39) being inclined so that planes along which the levers move when rotated by the rotary shafts define an upside-down polygonal cone, and so that when the levers rotate the crease-forming portions of the levers trench the piece of dough in a direction such that the top surface is peeled, and such that projections, which consist of the peeled portions of the top surface, become thicker gradually as peeling proceeds.

4. The apparatus of claim 3, wherein the rotary shafts (37) extend outward and downward so that a distal end of each rotary shaft is located away from a centerline (CL) of the imaginary circle, and wherein each lever is secured to the corresponding rotary shaft so that the lever is inclined inward when a distal end of the lever approaches the centerline of the imaginary circle.