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Method and Apparatus for Continuously
Manufacturing Filled Buns

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☒ Claim(s) : paged 1 to paged 11	
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This invention relates to manufacturing filled buns, and more especially to continuous processes of manufacturing from a continuously fed mass of dough the filled buns consisting of a dough coating and a filling, without
5 exposing the filling.

In the prior-art methods the manufacture of high-quality filled buns, such as a bean-jam bun, required manual operations. In a conventional way of manually producing filled buns having a cover of a uniform thickness
10 without exposing the fillings, a mass of kneaded bread dough is divided into smaller masses of dough. Each of them is then stretched into a separate sheet of bread dough shaped as a circle or hexagon. A measured portion of a filling is put on the center of this separate sheet
15 of bread dough. The filling is enveloped by uniformly gathering the edges of the sheet, and then the dough is strongly pinched or twisted at the gathering point to prevent the dough edges from being separated due to the elasticity of the dough.

20 In the conventional dividing process the dough is weighed and mechanically divided by a piston cylinder. This tends to destroy the gluten network of the dough, and the quality of the dough is thus reduced. Since to recover the lost quality the dough must be later
25 processed, extra equipment is needed. It has also been difficult to automatically carry out those prior-art

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processes so as to produce low-cost, popular foods, such as bean-jam buns, since it requires a production complex. Thus, no simple method existed in which buns were continuously and automatically produced.

- 5 The publication entitled A Collection of Well-known Art, published February 20, 1980, by the Japanese Patent Office, shows, as a conventional technique, a winder having a roller for winding up a continuous sheet of bread dough from one of its sides into a bar of dough.
- 10 The winder has not been used for continuously manufacturing completely and neatly encrusted filled buns without exposing the filling. It aims at obtaining a product having a desired weight by cutting a horizontal bar of dough into pieces of equal lengths.
- 15 U.S. Pat. No. 4,692,109 discloses an apparatus for continuously cutting a filled cylindrical dough body wherein a blade shaped as a wedge penetrates, from above, the dough body being conveyed on a horizontal conveyor. To cut the dough body the blade is driven
- 20 both down and laterally. This complex mechanism hinders the efficient mass production of high-quality filled products. Further, the blade is liable to be forced into the filling, and the sections of the cut dough body where it is cut tend to have rough surfaces.
- 25 Furthermore, since the blade pushes the conveyor down, the dough body is deformed when it is cut so that nonuniformly-shaped products result.

Therefore, if a high-quality filled bun is to be automatically prepared from a continuously fed mass of dough, an apparatus and method has been required in

30 which the gluten network of the dough is sufficiently developed and kept unharmed, the filling is completely encrusted by the dough crust, and in which the dough



body is effectively and neatly cut and shaped.

According to one aspect of this invention, a method of continuously manufacturing filled buns is provided, which comprises:

continuously supplying a mass of dough on a horizontal conveyor,

stretching the travelling mass of dough into a sheet of a uniform width and thickness,

continuously depositing a filling on the sheet of dough while it is travelling on the conveyor,

winding up the travelling sheet of dough with the filling in a widthwise direction into a bar of dough so that the filling is surrounded by a sheet of dough,

causing the bar of dough to freely fall from the leading end of the conveyor, and

dividing the falling bar of dough by squeezing it with a divider having flat pressing surfaces, so that the bar is divided into separate pieces with no filling exposed.

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In a preferred method of this invention a filling is continuously deposited on a sheet of bread dough traveling horizontally on a conveyor. The sheet with the deposited filling is wound up into a continuous bar of bread dough consisting of a spiral of the sheet of bread dough centering around the filling. Then the traveling bar of the bread dough is made to fall from the leading end of the conveyor and is divided during the fall. In the dividing process, slidable contacting plates having wide flat surfaces are used instead of conventional wedge-shaped blades to divide the bar-shaped bread dough. They do so by applying a pressing force to its periphery. This method aims to provide a method to continuously produce separate pieces of filled dough products without exposing the filling at the sections where they are cut. This can be done because dough, which is resilient, differs from the plastic filling in its rheological properties. That is, because the tensile strength of the bread dough is greater than that of the filling, which is almost zero, this enables the filled bar to be separated with no filling being exposed when a pressing force is applied in both the vertical and tangential directions to the periphery of the bar.

In the accompanying drawings:-

Fig. 1 is an overall schematic perspective view of one of the embodiments of this invention.

Fig. 2 is a plan view of the embodiment of a divider having pressing plates.

Fig. 3 is a plan view of the divider showing the movements of the pressing plates.

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Fig. 4 is a side view of the pressing plates.

Fig. 5 is a perspective view of another embodiment of a divider.

Figs. 6 and 7 are explanatory schematics showing the operation of dividing a bar-shaped material.

The structure of an apparatus of this invention will now be explained by reference to the drawings.

In Fig. 1, showing the overall and perspective constitution of an apparatus of this invention, a mass of bread dough 1, kneaded and prepared in any conventional way, is transferred from a feeding conveyor 61 to a transfer conveyor 62, which runs faster than the feeding conveyor 61. These conveyors can be belt conveyors.

A stretcher 2 that stretches the mass of dough 1 into a sheet of bread dough 11 is disposed above the conveyors 61, 62 with a preset distance between the stretcher and the upper surfaces of the conveyors. The stretcher consists of a roller 21 reciprocating in the traveling and the reverse directions.

Any of those stretchers disclosed in U.S. Patent Nos. 5,041,917, 5,164,201, and 5,151,024, which were granted to the same applicant as that of this application, can be used to stretch the mass of bread dough 1.

Means 4 for depositing a filling on the sheet of bread dough is disposed downstream of the stretcher 2. It continuously deposits a uniform amount of filling 41, such as bean jam.



Any publicly known apparatus, such as a dosing feeder, can be used as the depositing means 41 to continuously deposit a uniform quantity of the filling.

Means 5 for winding up the sheet of bread dough 11 with the deposited filling 41, known as a "side winder," is located downstream of the depositing means 4. It has a toothed roller 51 rotating in the direction shown by an arrow to roll up the sheet of dough 11 into a bar of bread dough 12. The winder 5 is disposed in a direction aslant the widthwise direction of the sheet of bread dough 11. It is pivoted at one of its ends so that the angle between the winding roller 51 and the sheet of bread dough can be adjusted both to locate the wound bar of bread dough at a preset course on the conveyor and to select a position where the wound bar of bread dough starts traveling in the traveling direction of the conveyor belt. The wound bar of bread dough is guided by a guide roller (not shown) disposed above the conveyor 62 by being passed through and between the guide roller and the conveyor 62.

Any publicly known side winder, such as those that are listed in the above-mentioned publication, published by the Patent Office, can be used as the winder 5.

A divider 7 is located at the downstream end of the transfer conveyor 62. The wound bar of dough smoothly and freely falls from the downstream end of the conveyor belt and is divided just after the bar of bread dough passes around the downstream end of the conveyor, where the conveyor belt moves about a roller supporting the belt.

One of the embodiments of the divider of this invention will now be explained. Fig. 2 shows pressing plates 17

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for dividing a bar-shaped material 15 by applying a pressing force from two directions to the periphery of the bar-shaped material.

5 The pressing plates 17 face each other, and are spaced apart from each other to leave a sufficient space for the bar-shaped material 15 to pass between them. The plates 17 are joined by pivoting links 18.

10 Referring to Figs. 2, 3, and 4, the simultaneous movements of the pressing plates 17 in opposite directions is constrained by the links 18 so that the bar-shaped material 15 is pressed to be divided into a round piece 8.

15 In this dividing process, since the pressing plates 17 thrust through the bar-shaped material 15 while moving in a direction tangential to the periphery of the bar-shaped material 15, a torsional stress is generated at the pressing point so as to securely cover the sections where they are divided with the bread dough 1. This prevents the filling 13 from being exposed. As
20 shown in Fig. 6, the pressing plates 17 exert a pressing force on the periphery of the bar-shaped bread dough 15 toward its center such that due to the resiliency of the outer envelope of the bar 15 the plates urge the envelope to form a neck 22 while separating and moving
25 the filling 13 from the neck into the areas above and below it. As shown in Fig. 7, when the plates abut, the bread dough envelope 16 is also divided into two parts.

30 When the pressing plates 17, which have flat pressing surfaces unlike the conventional wedge-shaped blades, are used, a neatly rounded product 8, such as a bean jam bun with a round cross section, is obtained, with no filling exposed.



In this case, various kinds of buns of any weight, or containing any weight ratio of filling to dough, can be produced by adjusting the thickness and width of the supplied sheet of bread dough and the quantity of the deposited filling. The stretched sheet of bread dough can be cut by using a conventional cutter (not shown), if necessary, along the traveling direction of the dough sheet, so that a sheet of bread dough having any desired width can be subjected to the succeeding winding process.

The dividing process of this invention, involving the effect of a torsional stress, can also be done by using an assembly consisting of more than two pressing members.

Fig. 5 shows an example of such a divider. It consists of pressing members 19 slidably disposed in a frame 20 so as to form an opening at the center. The opening and closing movements of the pressing members 19 divide the bar-shaped material passing through the opening.

In Figs. 6 and 7, the arrow "d" shows the traveling direction of a bar-shaped dough 15 continuously supplied. While the bar-shaped dough 15 is continuously supplied, pressing plates 17 move up and down, as shown by the arrows "e" and "e'," in synchronism with the movement of the bar-shaped dough 15 being supplied. During the time the pressing plates 17 move toward each other, they move down, i.e., in the direction "e." The closing of the pressing plates coincides with the lowest point of the downward movement of the pressing plates 17, thereby dividing the bar-shaped dough 15 to ensure that uniformly divided and smoothly shaped dough products are obtained. During the time the pressing plates 17 move up, i.e., in the direction "e'," they



move away from each other so as to allow the bar-shaped dough 15 to pass therebetween. After the pressing plates 17 reach the uppermost position, they start to move down to squeeze the dough bar 15. These movements are repeated.

As shown in Figs. 6 and 7, the pressing plates 17 can divide and shape a separate piece of product 8, in which a filling 13 is completely surrounded by a bread dough coating 16, without exposing the filling. The winder 5 may not be a sufficient means of securely encrusting a filling with a dough coating to form a filled dough bar. However, the divider 7 of this embodiment eliminates any loosening of the dough coating to expose the filling due to the torsional force it applies to the product in forming it at its top and bottom areas. Thus, the two simple means cooperate to produce filled buns of a good quality in a very simple manner.

It will thus be seen that the present invention, at least in its preferred forms, provides an apparatus and method by which a continuously fed mass of dough is continuously processed to produce separate filled buns of high quality; and furthermore provides an apparatus and method by which completely encrusted and neatly shaped and filled buns of a uniform weight are produced without exposing their fillings; and furthermore provides a simple apparatus and method in which separate filled buns are continuously and automatically manufactured.

As described above, this invention can achieve the manufacture of high-quality filled buns by using an apparatus of a simple structure. Also, it has great industrial effects in reducing production labor.

It is to be understood that the term "filled bun" as used herein means any food product which consists basically of a piece of dough with a filling inside it.





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Claims:

1. A method of manufacturing filled buns from a mass of dough, comprising the steps of
continuously supplying a mass of dough on a horizontal
5 conveyor,
stretching the traveling mass of dough into a sheet of dough of a uniform width and thickness,
continuously depositing a filling on the sheet of dough while it is traveling on the conveyor,
10 winding up the traveling sheet of dough with the filling in a widthwise direction into a bar of dough so that the filling is surrounded by a sheet of dough,
causing the bar of dough to freely fall from the leading end of the conveyor, and
15 dividing the falling bar of dough by squeezing it with a divider having flat pressing surfaces, so that the bar is divided into separate pieces with no filling exposed.
2. The method of claim 1, wherein the bar of dough is divided by causing two pressing surfaces to move toward
20 each other while moving in directions that are opposite to each other and perpendicular to the traveling direction of the dough bar.
3. The method of claim 1, characterized in that in the dividing step the bar of dough is divided while said
25 pressing surfaces are being reciprocated in synchronism with the movement of the bar of dough, along the traveling direction thereof, to move away from each other when they move up and to move toward each other when they move down.



4. An apparatus for manufacturing filled buns from a mass of dough supplied on a conveyor, comprising

means for stretching the traveling mass of dough into a sheet of dough of a uniform thickness,

5 means for depositing a filling on the traveling sheet of dough,

means for winding up the traveling sheet of dough with the filling in a widthwise direction into a bar of dough so that the filling is surrounded by a sheet of dough,

10 and

means for dividing the bar of dough having a plurality of pressing surfaces to squeeze the bar of dough so that the bar is divided into separate pieces with no filling exposed.

15 5. The apparatus of claim 4, wherein the dividing means has two vertically-positioned and opposite pressing surfaces.

20 6. The apparatus of claim 4, further comprising means for reciprocating the pressing surfaces along the traveling direction of the bar of dough while the bar of dough is being divided, and causing them to move away from each other when they move up and to move toward each other when they move down.

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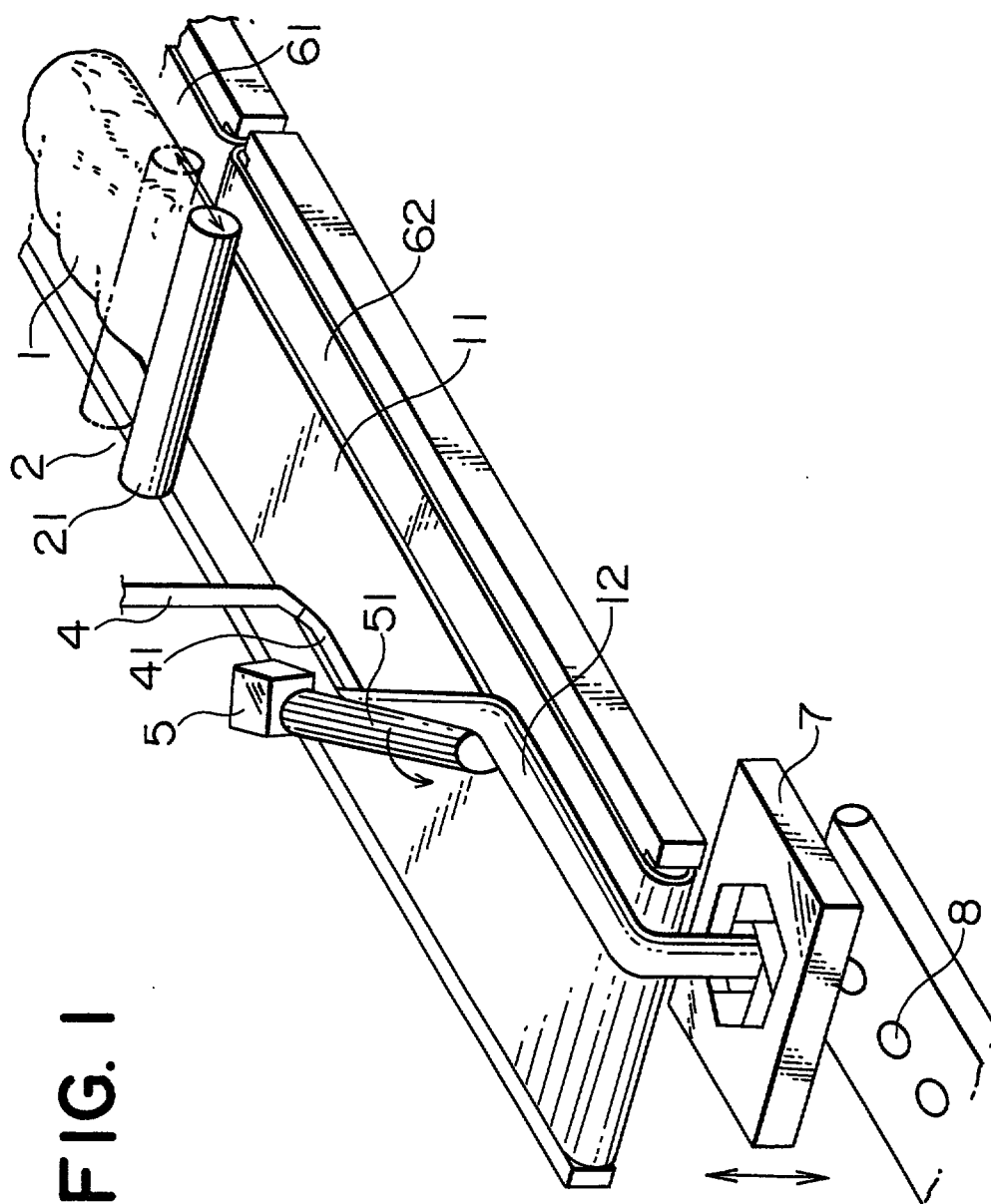
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ABSTRACT

Method & Apparatus for Continuously
Manufacturing Filled Buns

A method that comprises continuously depositing a filling (41) on a sheet of bread dough (11) and winding up the sheet with the deposited filling from one of its sides into a bar (15) of bread dough, with the filling
5 centered. This simple method serves to reduce production labor.

Most illustrative drawing to accompany the abstract for publication is Figure 1.



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FIG. 2

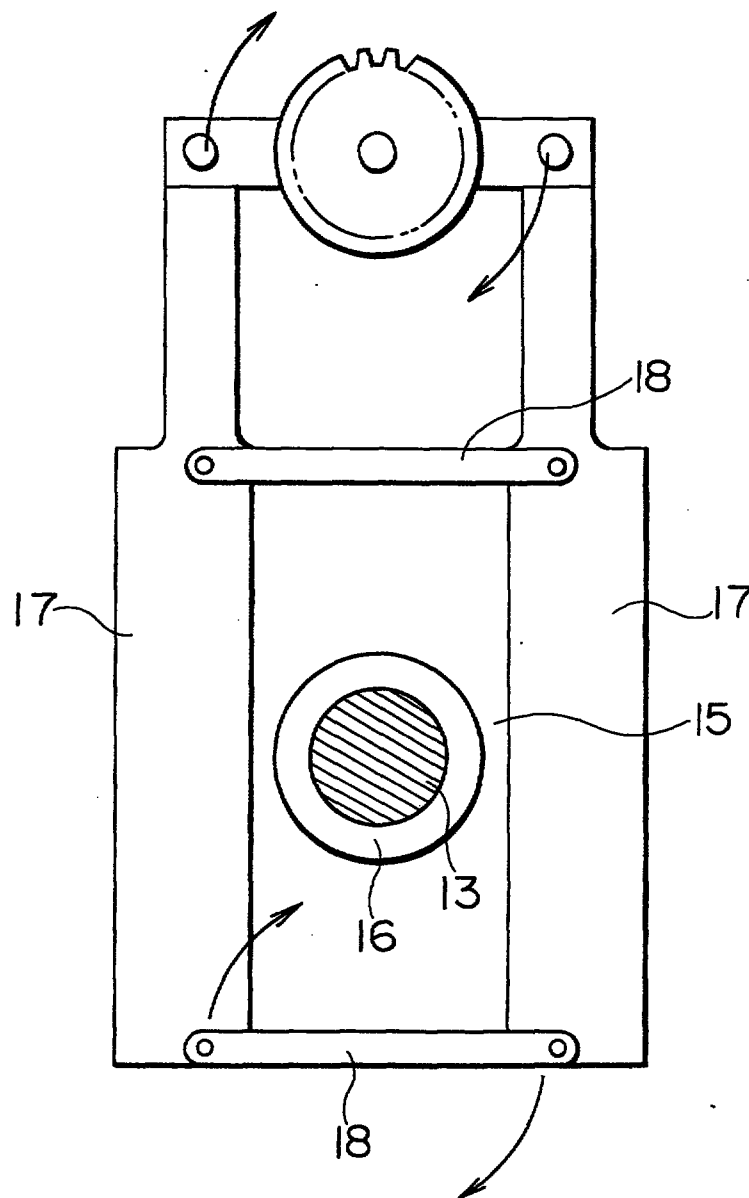


FIG. 3

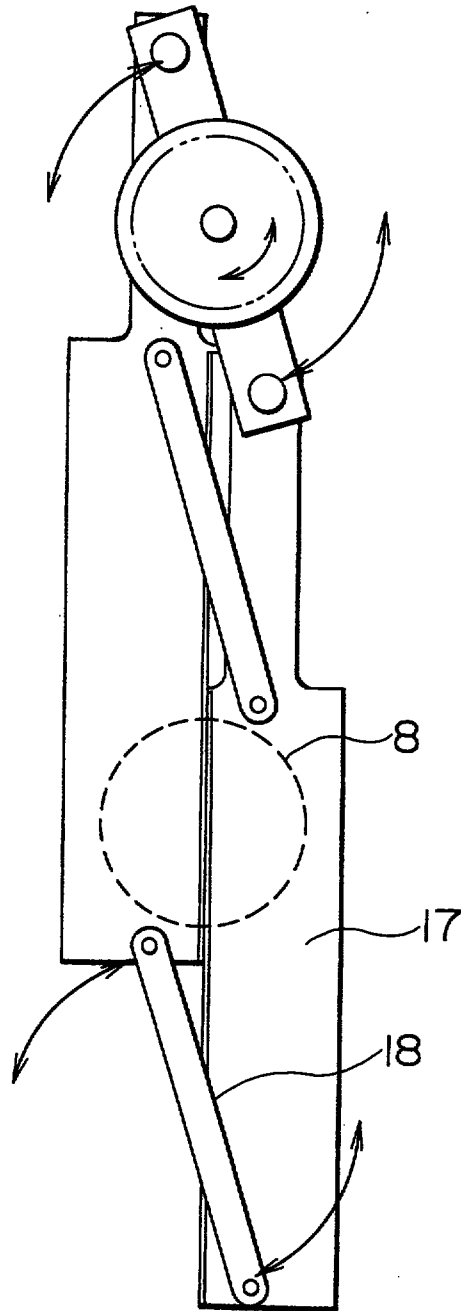


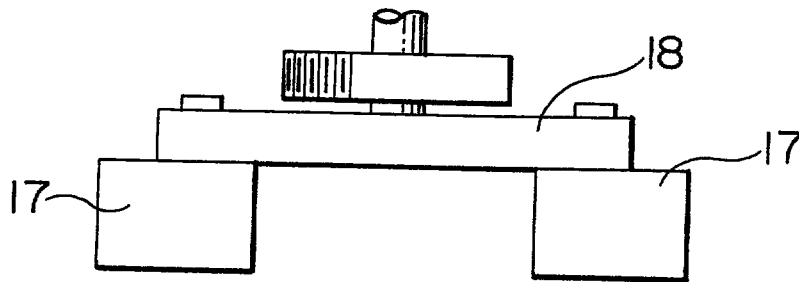
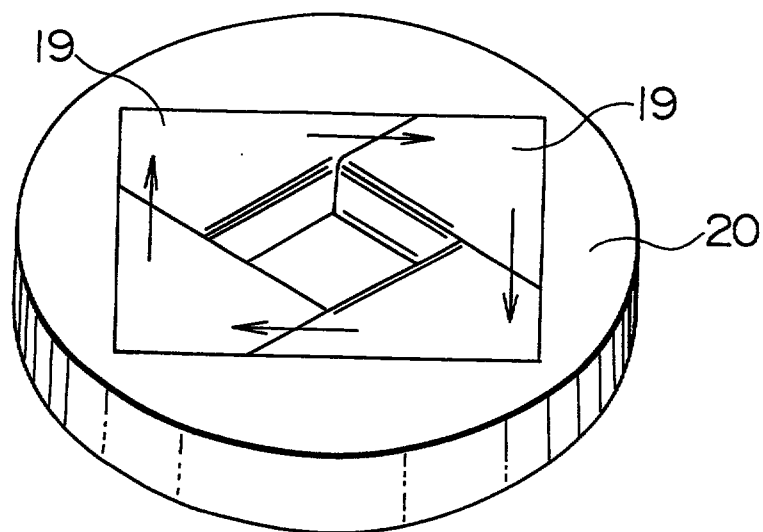
FIG. 4**FIG. 5**

FIG. 6

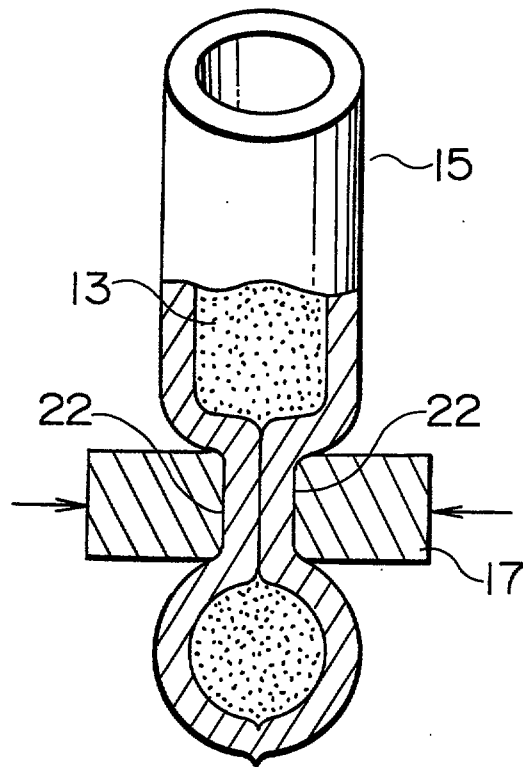
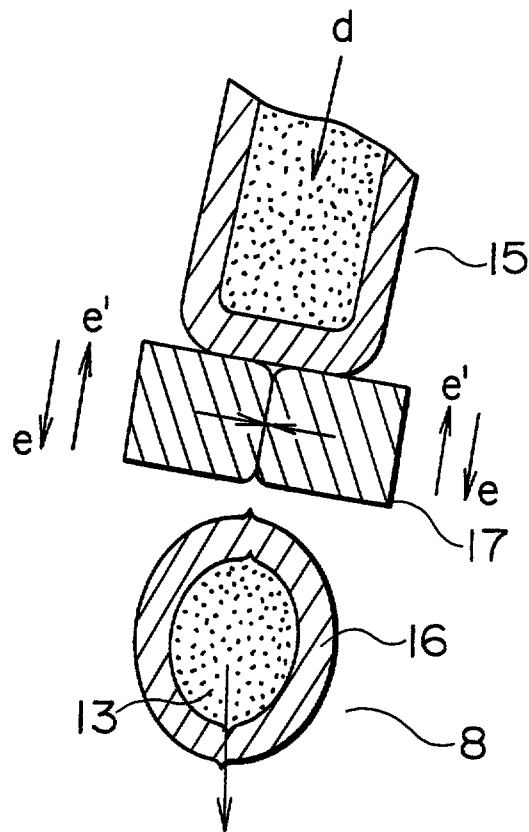


FIG. 7



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Method and Apparatus for Continuously
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This invention relates to manufacturing filled buns, and more especially to continuous processes of manufacturing from a continuously fed mass of dough the filled buns consisting of a dough coating and a filling, without exposing the filling.

In the prior-art methods the manufacture of high-quality filled buns, such as a bean-jam bun, required manual operations. In a conventional way of manually producing filled buns having a cover of a uniform thickness without exposing the fillings, a mass of kneaded bread dough is divided into smaller masses of dough. Each of them is then stretched into a separate sheet of bread dough shaped as a circle or hexagon. A measured portion of a filling is put on the center of this separate sheet of bread dough. The filling is enveloped by uniformly gathering the edges of the sheet, and then the dough is strongly pinched or twisted at the gathering point to prevent the dough edges from being separated due to the elasticity of the dough.

In the conventional dividing process the dough is weighed and mechanically divided by a piston cylinder. This tends to destroy the gluten network of the dough, and the quality of the dough is thus reduced. Since to recover the lost quality the dough must be later processed, extra equipment is needed. It has also been difficult to automatically carry out these prior-art

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processes so as to produce low-cost, popular foods, such as bean-jam buns, since it requires a production complex. Thus, no simple method existed in which buns were continuously and automatically produced.

The publication entitled A Collection of Well-known Art, published February 20, 1980, by the Japanese Patent Office, shows, as a conventional technique, a winder having a roller for winding up a continuous sheet of bread dough from one of its sides into a bar of dough.

The winder has not been used for continuously manufacturing completely and neatly encrusted filled buns without exposing the filling. It aims at obtaining a product having a desired weight by cutting a horizontal bar of dough into pieces of equal lengths.

U.S. Pat. No. 4,692,109 discloses an apparatus for continuously cutting a filled cylindrical dough body wherein a blade shaped as a wedge penetrates, from above, the dough body being conveyed on a horizontal conveyor. To cut the dough body the blade is driven both down and laterally. This complex mechanism hinders the efficient mass production of high-quality filled products. Further, the blade is liable to be forced into the filling, and the sections of the cut dough body where it is cut tend to have rough surfaces. Furthermore, since the blade pushes the conveyor down, the dough body is deformed when it is cut so that nonuniformly-shaped products result.

Therefore, if a high-quality filled bun is to be automatically prepared from a continuously fed mass of dough, an apparatus and method has been required in which the gluten network of the dough is sufficiently developed and kept unharmed, the filling is completely encrusted by the dough crust, and in which the dough

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body is effectively and neatly cut and shaped.

According to one aspect of this invention, a method of continuously manufacturing filled buns is provided, which comprises:

continuously supplying a mass of dough on a horizontal conveyor,

stretching the travelling mass of dough into a sheet of a uniform width and thickness,

continuously depositing a filling on the sheet of dough while it is travelling on the conveyor,

winding up the travelling sheet of dough with the filling in a widthwise direction into a bar of dough so that the filling is surrounded by a sheet of dough,

causing the bar of dough to freely fall from the leading end of the conveyor, and

dividing the falling bar of dough by squeezing it with a divider having flat pressing surfaces, so that the bar is divided into separate pieces with no filling exposed.

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In a preferred method of this invention a filling is continuously deposited on a sheet of bread dough traveling horizontally on a conveyor. The sheet with the deposited filling is wound up into a continuous bar of bread dough consisting of a spiral of the sheet of bread dough centering around the filling. Then the traveling bar of the bread dough is made to fall from the leading end of the conveyor and is divided during the fall. In the dividing process, slidable contacting plates having wide flat surfaces are used instead of conventional wedge-shaped blades to divide the bar-shaped bread dough. They do so by applying a pressing force to its periphery. This method aims to provide a method to continuously produce separate pieces of filled dough products without exposing the filling at the sections where they are cut. This can be done because dough, which is resilient, differs from the plastic filling in its rheological properties. That is, because the tensile strength of the bread dough is greater than that of the filling, which is almost zero, this enables the filled bar to be separated with no filling being exposed when a pressing force is applied in both the vertical and tangential directions to the periphery of the bar.

In the accompanying drawings:-

Fig. 1 is an overall schematic perspective view of one of the embodiments of this invention.

Fig. 2 is a plan view of the embodiment of a divider having pressing plates.

Fig. 3 is a plan view of the divider showing the movements of the pressing plates.

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Fig. 4 is a side view of the pressing plates.

Fig. 5 is a perspective view of another embodiment of a divider.

Figs. 6 and 7 are explanatory schematics showing the operation of dividing a bar-shaped material.

The structure of an apparatus of this invention will now be explained by reference to the drawings.

In Fig. 1, showing the overall and perspective constitution of an apparatus of this invention, a mass of bread dough 1, kneaded and prepared in any conventional way, is transferred from a feeding conveyor 61 to a transfer conveyor 62, which runs faster than the feeding conveyor 61. These conveyors can be belt conveyors.

A stretcher 2 that stretches the mass of dough 1 into a sheet of bread dough 11 is disposed above the conveyors 61, 62 with a preset distance between the stretcher and the upper surfaces of the conveyors. The stretcher consists of a roller 21 reciprocating in the traveling and the reverse directions.

Any of those stretchers disclosed in U.S. Patent Nos. 5,041,917, 5,164,201, and 5,151,024, which were granted to the same applicant as that of this application, can be used to stretch the mass of bread dough 1.

Means 4 for depositing a filling on the sheet of bread dough is disposed downstream of the stretcher 2. It continuously deposits a uniform amount of filling 41, such as bean jam.

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Any publicly known apparatus, such as a dosing feeder, can be used as the depositing means 41 to continuously deposit a uniform quantity of the filling.

Means 5 for winding up the sheet of bread dough 11 with the deposited filling 41, known as a "side winder," is located downstream of the depositing means 4. It has a toothed roller 51 rotating in the direction shown by an arrow to roll up the sheet of dough 11 into a bar of bread dough 12. The winder 5 is disposed in a direction aslant the widthwise direction of the sheet of bread dough 11. It is pivoted at one of its ends so that the angle between the winding roller 51 and the sheet of bread dough can be adjusted both to locate the wound bar of bread dough at a preset course on the conveyor and to select a position where the wound bar of bread dough starts traveling in the traveling direction of the conveyor belt. The wound bar of bread dough is guided by a guide roller (not shown) disposed above the conveyor 62 by being passed through and between the guide roller and the conveyor 62.

Any publicly known side winder, such as those that are listed in the above-mentioned publication, published by the Patent Office, can be used as the winder 5.

A divider 7 is located at the downstream end of the transfer conveyor 62. The wound bar of dough smoothly and freely falls from the downstream end of the conveyor belt and is divided just after the bar of bread dough passes around the downstream end of the conveyor, where the conveyor belt moves about a roller supporting the belt.

One of the embodiments of the divider of this invention will now be explained. Fig. 2 shows pressing plates 17

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for dividing a bar-shaped material 15 by applying a pressing force from two directions to the periphery of the bar-shaped material.

The pressing plates 17 face each other, and are spaced apart from each other to leave a sufficient space for the bar-shaped material 15 to pass between them. The plates 17 are joined by pivoting links 18.

Referring to Figs. 2, 3, and 4, the simultaneous movements of the pressing plates 17 in opposite directions is constrained by the links 18 so that the bar-shaped material 15 is pressed to be divided into a round piece 8.

In this dividing process, since the pressing plates 17 thrust through the bar-shaped material 15 while moving in a direction tangential to the periphery of the bar-shaped material 15, a torsional stress is generated at the pressing point so as to securely cover the sections where they are divided with the bread dough 1. This prevents the filling 13 from being exposed. As shown in Fig. 6, the pressing plates 17 exert a pressing force on the periphery of the bar-shaped bread dough 15 toward its center such that due to the resiliency of the outer envelope of the bar 15 the plates urge the envelope to form a neck 22 while separating and moving the filling 13 from the neck into the areas above and below it. As shown in Fig. 7, when the plates abut, the bread dough envelope 16 is also divided into two parts.

When the pressing plates 17, which have flat pressing surfaces unlike the conventional wedge-shaped blades, are used, a neatly rounded product 8, such as a bean jam bun with a round cross section, is obtained, with no filling exposed.

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In this case, various kinds of buns of any weight, or containing any weight ratio of filling to dough, can be produced by adjusting the thickness and width of the supplied sheet of bread dough and the quantity of the deposited filling. The stretched sheet of bread dough can be cut by using a conventional cutter (not shown), if necessary, along the traveling direction of the dough sheet, so that a sheet of bread dough having any desired width can be subjected to the succeeding winding process.

The dividing process of this invention, involving the effect of a torsional stress, can also be done by using an assembly consisting of more than two pressing members.

Fig. 5 shows an example of such a divider. It consists of pressing members 19 slidably disposed in a frame 20 so as to form an opening at the center. The opening and closing movements of the pressing members 19 divide the bar-shaped material passing through the opening.

In Figs. 6 and 7, the arrow "d" shows the traveling direction of a bar-shaped dough 15 continuously supplied. While the bar-shaped dough 15 is continuously supplied, pressing plates 17 move up and down, as shown by the arrows "e" and "e'," in synchronism with the movement of the bar-shaped dough 15 being supplied. During the time the pressing plates 17 move toward each other, they move down, i.e., in the direction "e." The closing of the pressing plates coincides with the lowest point of the downward movement of the pressing plates 17, thereby dividing the bar-shaped dough 15 to ensure that uniformly divided and smoothly shaped dough products are obtained. During the time the pressing plates 17 move up, i.e., in the direction "e'," they





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move away from each other so as to allow the bar-shaped dough 15 to pass therebetween. After the pressing plates 17 reach the uppermost position, they start to move down to squeeze the dough bar 15. These movements are repeated.

As shown in Figs. 6 and 7, the pressing plates 17 can divide and shape a separate piece of product 8, in which a filling 13 is completely surrounded by a bread dough coating 16, without exposing the filling. The winder 5 may not be a sufficient means of securely encrusting a filling with a dough coating to form a filled dough bar. However, the divider 7 of this embodiment eliminates any loosening of the dough coating to expose the filling due to the torsional force it applies to the product in forming it at its top and bottom areas. Thus, the two simple means cooperate to produce filled buns of a good quality in a very simple manner.

It will thus be seen that the present invention, at least in its preferred forms, provides an apparatus and method by which a continuously fed mass of dough is continuously processed to produce separate filled buns of high quality; and furthermore provides an apparatus and method by which completely encrusted and neatly shaped and filled buns of a uniform weight are produced without exposing their fillings; and furthermore provides a simple apparatus and method in which separate filled buns are continuously and automatically manufactured.

As described above, this invention can achieve the manufacture of high-quality filled buns by using an apparatus of a simple structure. Also, it has great industrial effects in reducing production labor.

It is to be understood that the term "filled bun" as used herein means any food product which consists basically of a piece of dough with a filling inside it.

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Claims:

1. A method of manufacturing filled buns from a mass of dough, comprising the steps of
continuously supplying a mass of dough on a horizontal conveyor,
stretching the traveling mass of dough into a sheet of dough of a uniform width and thickness,
continuously depositing a filling on the sheet of dough while it is traveling on the conveyor,
winding up the traveling sheet of dough with the filling in a widthwise direction into a bar of dough so that the filling is surrounded by a sheet of dough,
causing the bar of dough to freely fall from the leading end of the conveyor, and
dividing the falling bar of dough by squeezing it with a divider having flat pressing surfaces, so that the bar is divided into separate pieces with no filling exposed.
2. The method of claim 1, wherein the bar of dough is divided by causing two pressing surfaces to move toward each other while moving in directions that are opposite to each other and perpendicular to the traveling direction of the dough bar.
3. The method of claim 1, characterized in that in the dividing step the bar of dough is divided while said pressing surfaces are being reciprocated in synchronism with the movement of the bar of dough, along the traveling direction thereof, to move away from each other when they move up and to move toward each other when they move down.



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4. An apparatus for manufacturing filled buns from a mass of dough supplied on a conveyor, comprising

means for stretching the traveling mass of dough into a sheet of dough of a uniform thickness,

means for depositing a filling on the traveling sheet of dough,

means for winding up the traveling sheet of dough with the filling in a widthwise direction into a bar of dough so that the filling is surrounded by a sheet of dough, and

means for dividing the bar of dough having a plurality of pressing surfaces to squeeze the bar of dough so that the bar is divided into separate pieces with no filling exposed.

5. The apparatus of claim 4, wherein the dividing means has two vertically-positioned and opposite pressing surfaces.

6. The apparatus of claim 4, further comprising means for reciprocating the pressing surfaces along the traveling direction of the bar of dough while the bar of dough is being divided, and causing them to move away from each other when they move up and to move toward each other when they move down.

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Method and Apparatus for Continuously
Manufacturing Filled Buns

This invention relates to manufacturing filled buns, and more especially to continuous processes of manufacturing from a continuously fed mass of dough the filled buns consisting of a dough coating and a filling, without exposing the filling.

In the prior-art methods the manufacture of high-quality filled buns, such as a bean-jam bun, required manual operations. In a conventional way of manually producing filled buns having a cover of a uniform thickness without exposing the fillings, a mass of kneaded bread dough is divided into smaller masses of dough. Each of them is then stretched into a separate sheet of bread dough shaped as a circle or hexagon. A measured portion of a filling is put on the center of this separate sheet of bread dough. The filling is enveloped by uniformly gathering the edges of the sheet, and then the dough is strongly pinched or twisted at the gathering point to prevent the dough edges from being separated due to the elasticity of the dough.

In the conventional dividing process the dough is weighed and mechanically divided by a piston cylinder. This tends to destroy the gluten network of the dough, and the quality of the dough is thus reduced. Since to recover the lost quality the dough must be later processed, extra equipment is needed. It has also been difficult to automatically carry out those prior-art

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processes so as to produce low-cost, popular foods, such as bean-jam buns, since it requires a production complex. Thus, no simple method existed in which buns were continuously and automatically produced.

The publication entitled A Collection of Well-known Art, published February 20, 1980, by the Japanese Patent Office, shows, as a conventional technique, a winder having a roller for winding up a continuous sheet of bread dough from one of its sides into a bar of dough.

The winder has not been used for continuously manufacturing completely and neatly encrusted filled buns without exposing the filling. It aims at obtaining a product having a desired weight by cutting a horizontal bar of dough into pieces of equal lengths.

U.S. Pat. No. 4,692,109 discloses an apparatus for continuously cutting a filled cylindrical dough body wherein a blade shaped as a wedge penetrates, from above, the dough body being conveyed on a horizontal conveyor. To cut the dough body the blade is driven both down and laterally. This complex mechanism hinders the efficient mass production of high-quality filled products. Further, the blade is liable to be forced into the filling, and the sections of the cut dough body where it is cut tend to have rough surfaces. Furthermore, since the blade pushes the conveyor down, the dough body is deformed when it is cut so that nonuniformly-shaped products result.

Therefore, if a high-quality filled bun is to be automatically prepared from a continuously fed mass of dough, an apparatus and method has been required in which the gluten network of the dough is sufficiently developed and kept unharmed, the filling is completely encrusted by the dough crust, and in which the dough

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body is effectively and neatly cut and shaped.

According to one aspect of this invention, a method of continuously manufacturing filled buns is provided, which comprises:

- continuously supplying a mass of dough on a horizontal conveyor,

- stretching the travelling mass of dough into a sheet of a uniform width and thickness,

- continuously depositing a filling on the sheet of dough while it is travelling on the conveyor,

- winding up the travelling sheet of dough with the filling in a widthwise direction into a bar of dough so that the filling is surrounded by a sheet of dough,

- causing the bar of dough to freely fall from the leading end of the conveyor, and

- dividing the falling bar of dough by squeezing it with a divider having flat pressing surfaces, so that the bar is divided into separate pieces with no filling exposed.

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In a preferred method of this invention a filling is continuously deposited on a sheet of bread dough traveling horizontally on a conveyor. The sheet with the deposited filling is wound up into a continuous bar of bread dough consisting of a spiral of the sheet of bread dough centering around the filling. Then the traveling bar of the bread dough is made to fall from the leading end of the conveyor and is divided during the fall. In the dividing process, slidable contacting plates having wide flat surfaces are used instead of conventional wedge-shaped blades to divide the bar-shaped bread dough. They do so by applying a pressing force to its periphery. This method aims to provide a method to continuously produce separate pieces of filled dough products without exposing the filling at the sections where they are cut. This can be done because dough, which is resilient, differs from the plastic filling in its rheological properties. That is, because the tensile strength of the bread dough is greater than that of the filling, which is almost zero, this enables the filled bar to be separated with no filling being exposed when a pressing force is applied in both the vertical and tangential directions to the periphery of the bar.

In the accompanying drawings:-

Fig. 1 is an overall schematic perspective view of one of the embodiments of this invention.

Fig. 2 is a plan view of the embodiment of a divider having pressing plates.

Fig. 3 is a plan view of the divider showing the movements of the pressing plates.

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Fig. 4 is a side view of the pressing plates.

Fig. 5 is a perspective view of another embodiment of a divider.

Figs. 6 and 7 are explanatory schematics showing the operation of dividing a bar-shaped material.

The structure of an apparatus of this invention will now be explained by reference to the drawings.

In Fig. 1, showing the overall and perspective constitution of an apparatus of this invention, a mass of bread dough 1, kneaded and prepared in any conventional way, is transferred from a feeding conveyor 61 to a transfer conveyor 62, which runs faster than the feeding conveyor 61. These conveyors can be belt conveyors.

A stretcher 2 that stretches the mass of dough 1 into a sheet of bread dough 11 is disposed above the conveyors 61, 62 with a preset distance between the stretcher and the upper surfaces of the conveyors. The stretcher consists of a roller 21 reciprocating in the traveling and the reverse directions.

Any of those stretchers disclosed in U.S. Patent Nos. 5,041,917, 5,164,201, and 5,151,024, which were granted to the same applicant as that of this application, can be used to stretch the mass of bread dough 1.

Means 4 for depositing a filling on the sheet of bread dough is disposed downstream of the stretcher 2. It continuously deposits a uniform amount of filling 41, such as bean jam.

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Any publicly known apparatus, such as a dosing feeder, can be used as the depositing means 41 to continuously deposit a uniform quantity of the filling.

Means 5 for winding up the sheet of bread dough 11 with the deposited filling 41, known as a "side winder," is located downstream of the depositing means 4. It has a toothed roller 51 rotating in the direction shown by an arrow to roll up the sheet of dough 11 into a bar of bread dough 12. The winder 5 is disposed in a direction aslant the widthwise direction of the sheet of bread dough 11. It is pivoted at one of its ends so that the angle between the winding roller 51 and the sheet of bread dough can be adjusted both to locate the wound bar of bread dough at a preset course on the conveyor and to select a position where the wound bar of bread dough starts traveling in the traveling direction of the conveyor belt. The wound bar of bread dough is guided by a guide roller (not shown) disposed above the conveyor 62 by being passed through and between the guide roller and the conveyor 62.

Any publicly known side winder, such as those that are listed in the above-mentioned publication, published by the Patent Office, can be used as the winder 5.

A divider 7 is located at the downstream end of the transfer conveyor 62. The wound bar of dough smoothly and freely falls from the downstream end of the conveyor belt and is divided just after the bar of bread dough passes around the downstream end of the conveyor, where the conveyor belt moves about a roller supporting the belt.

One of the embodiments of the divider of this invention will now be explained. Fig. 2 shows pressing plates 17

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for dividing a bar-shaped material 15 by applying a pressing force from two directions to the periphery of the bar-shaped material.

The pressing plates 17 face each other, and are spaced apart from each other to leave a sufficient space for the bar-shaped material 15 to pass between them. The plates 17 are joined by pivoting links 18.

Referring to Figs. 2, 3, and 4, the simultaneous movements of the pressing plates 17 in opposite directions is constrained by the links 18 so that the bar-shaped material 15 is pressed to be divided into a round piece 8.

In this dividing process, since the pressing plates 17 thrust through the bar-shaped material 15 while moving in a direction tangential to the periphery of the bar-shaped material 15, a torsional stress is generated at the pressing point so as to securely cover the sections where they are divided with the bread dough 1. This prevents the filling 13 from being exposed. As shown in Fig. 6, the pressing plates 17 exert a pressing force on the periphery of the bar-shaped bread dough 15 toward its center such that due to the resiliency of the outer envelope of the bar 15 the plates urge the envelope to form a neck 22 while separating and moving the filling 13 from the neck into the areas above and below it. As shown in Fig. 7, when the plates abut, the bread dough envelope 16 is also divided into two parts.

When the pressing plates 17, which have flat pressing surfaces unlike the conventional wedge-shaped blades, are used, a neatly rounded product 8, such as a bean jam bun with a round cross section, is obtained, with no filling exposed.

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In this case, various kinds of buns of any weight, or containing any weight ratio of filling to dough, can be produced by adjusting the thickness and width of the supplied sheet of bread dough and the quantity of the deposited filling. The stretched sheet of bread dough can be cut by using a conventional cutter (not shown), if necessary, along the traveling direction of the dough sheet, so that a sheet of bread dough having any desired width can be subjected to the succeeding winding process.

The dividing process of this invention, involving the effect of a torsional stress, can also be done by using an assembly consisting of more than two pressing members.

Fig. 5 shows an example of such a divider. It consists of pressing members 19 slidably disposed in a frame 20 so as to form an opening at the center. The opening and closing movements of the pressing members 19 divide the bar-shaped material passing through the opening.

In Figs. 6 and 7, the arrow "d" shows the traveling direction of a bar-shaped dough 15 continuously supplied. While the bar-shaped dough 15 is continuously supplied, pressing plates 17 move up and down, as shown by the arrows "e" and "e'," in synchronism with the movement of the bar-shaped dough 15 being supplied. During the time the pressing plates 17 move toward each other, they move down, i.e., in the direction "e." The closing of the pressing plates coincides with the lowest point of the downward movement of the pressing plates 17, thereby dividing the bar-shaped dough 15 to ensure that uniformly divided and smoothly shaped dough products are obtained. During the time the pressing plates 17 move up, i.e., in the direction "e'," they

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move away from each other so as to allow the bar-shaped dough 15 to pass therebetween. After the pressing plates 17 reach the uppermost position, they start to move down to squeeze the dough bar 15. These movements are repeated.

As shown in Figs. 6 and 7, the pressing plates 17 can divide and shape a separate piece of product 8, in which a filling 13 is completely surrounded by a bread dough coating 16, without exposing the filling. The winder 5 may not be a sufficient means of securely encrusting a filling with a dough coating to form a filled dough bar. However, the divider 7 of this embodiment eliminates any loosening of the dough coating to expose the filling due to the torsional force it applies to the product in forming it at its top and bottom areas. Thus, the two simple means cooperate to produce filled buns of a good quality in a very simple manner.

It will thus be seen that the present invention, at least in its preferred forms, provides an apparatus and method by which a continuously fed mass of dough is continuously processed to produce separate filled buns of high quality; and furthermore provides an apparatus and method by which completely encrusted and neatly shaped and filled buns of a uniform weight are produced without exposing their fillings; and furthermore provides a simple apparatus and method in which separate filled buns are continuously and automatically manufactured.

As described above, this invention can achieve the manufacture of high-quality filled buns by using an apparatus of a simple structure. Also, it has great industrial effects in reducing production labor.

It is to be understood that the term "filled bun" as used herein means any food product which consists basically of a piece of dough with a filling inside it.

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Claims:

1. A method of manufacturing filled buns from a mass of dough, comprising the steps of
continuously supplying a mass of dough on a horizontal conveyor,

stretching the traveling mass of dough into a sheet of dough of a uniform width and thickness,

continuously depositing a filling on the sheet of dough while it is traveling on the conveyor,

winding up the traveling sheet of dough with the filling in a widthwise direction into a bar of dough so that the filling is surrounded by a sheet of dough,

causing the bar of dough to freely fall from the leading end of the conveyor, and

dividing the falling bar of dough by squeezing it with a divider having flat pressing surfaces, so that the bar is divided into separate pieces with no filling exposed.

2. The method of claim 1, wherein the bar of dough is divided by causing two pressing surfaces to move toward each other while moving in directions that are opposite to each other and perpendicular to the traveling direction of the dough bar.

3. The method of claim 1, characterized in that in the dividing step the bar of dough is divided while said pressing surfaces are being reciprocated in synchronism with the movement of the bar of dough, along the traveling direction thereof, to move away from each other when they move up and to move toward each other when they move down.



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4. An apparatus for manufacturing filled buns from a mass of dough supplied on a conveyor, comprising

means for stretching the traveling mass of dough into a sheet of dough of a uniform thickness,

means for depositing a filling on the traveling sheet of dough,

means for winding up the traveling sheet of dough with the filling in a widthwise direction into a bar of dough so that the filling is surrounded by a sheet of dough, and

means for dividing the bar of dough having a plurality of pressing surfaces to squeeze the bar of dough so that the bar is divided into separate pieces with no filling exposed.

5. The apparatus of claim 4, wherein the dividing means has two vertically-positioned and opposite pressing surfaces.

6. The apparatus of claim 4, further comprising means for reciprocating the pressing surfaces along the traveling direction of the bar of dough while the bar of dough is being divided, and causing them to move away from each other when they move up and to move toward each other when they move down.



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