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A Method and Apparatus For Discharging A Food Material ✓

Background of Invention

1. Field of Invention

This invention relates to a method and apparatus for discharging a food material, more particularly to one for discharging a boiled rice material or other viscous materials in producing boiled rice balls and rice dumplings covered by bean jam.

2. Prior Art

Japanese Patent Publication No. 39-12276 discloses an apparatus for discharging a food material downward. The apparatus comprises three conical rollers disposed in upright positions to form a funnel-shaped space to receive the food material. In Fig. 1 (only two of the three rollers are shown), to illustrate a sectional view of the apparatus, these conical rollers 2 are rotated in the same direction at the same speed. The peripheral speed of each roller at a position indicated by an arrow A is faster than that at a position indicated by an arrow B. Therefore, the food material 4 charged into the funnel-shaped space, located at the position A, is subjected to a force in the circumferential direction, which force is greater than the force that the food material located at the position B is subjected to. Therefore, as shown by an arrow C, the food material is pulled downward.

In the prior-art apparatus some viscous food materials tend to slip on the surfaces of the conical rollers, so that the food materials



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cannot be smoothly fed downward. Furthermore, a rod-like food material 5 discharged from the funnel-shaped space has been not uniformly shaped. Namely, stably discharging the food material has been required.

Summary of Invention

Therefore, this invention aims to provide a method and apparatus to prevent a food material from slipping on the surface of a supply roller, and to stably discharge the food material and to feed it to the next station.

One object of this invention is to provide a method of discharging a food material comprising circularly disposing a plurality of supply rollers to form a funnel-shaped space to receive said food material, charging it into said funnel-shaped space, and rotating said supply rollers so as to move said food material and to feed it downward, characterized by providing grooves or ridges on the surface of each supply roller to enhance the frictional engagement of said supply rollers with said food material, thereby steadily feeding it downward.

By providing the grooves or ridges on the surface of each supply roller, the contact area of the surface of the roller with a boiled rice material increases so as to better avoid slipping between the roller and the material. Namely, the grooves or ridges can enhance the frictional engagement of the rollers with the material.

Another object of this invention is to provide an apparatus for discharging a food material comprising a food-material-supply section

which supplies a food material downward, said food-material-supply section comprising a plurality of rotatable supply rollers for supplying a food material downward, said supply rollers being circularly disposed so that they form a funnel-shaped space to receive said food material, characterized by each supply roller being provided with grooves or ridges.

Still another object of this invention is to provide an apparatus for discharging a food material comprising a food-material-supply section which supplies a food material downward, said food-material-supply section comprising a plurality of rotatable supply rollers for supplying a food material downward, said supply rollers being circularly disposed so that they form a funnel-shaped space to receive said food material, characterized by a supply pipe disposed under said food-material-supply section, to make a passageway for the food material, said supply pipe being provided with a scraper for said food material so that said scraper is positioned adjacent the inner wall of said supply pipe or so that said scraper slidably contacts the inner wall of said supply pipe.

By providing the supply pipe having the scraper, the food material such as a boiled rice material can be smoothly fed downward without adhering to the inner wall of the supply pipe. Namely, the scraper scrapes off any boiled rice material adhering to the inside wall of the supply pipe. This leads to the stable discharge of the food material.

The scraper must be shaped so that it extends throughout the inside wall of the supply pipe. Therefore, a wire-like scraper is spirally wound and it is disposed to slide within the supply pipe. The

scraper is disposed separately from, and is adapted to slidably move within, the supply pipe.

Brief Description of the Drawings

Fig. 1 shows a sectional side view of the prior-art apparatus.

Fig. 2 shows a side view, partly in cross section, of the apparatus for discharging a food material of this invention.

Fig. 3 shows an elevational view, partly in cross section, of the apparatus for discharging a food material of this invention.

Fig. 4 shows a plan view, partly in cross section, of the apparatus for discharging a food material of this invention.

Fig. 5 shows a side view in cross section of the material-joining section 30 of this invention.

Fig. 6 shows a side view in cross section of the material-joining section 30, to illustrate that the upper end of the scraper 35 is connected to a ring gear 62 which engages a gear 56, and a supply pipe 32 does not engage the gear 62.

Fig. 7 shows a side view in cross section of the material-joining section 30, to illustrate that in place of the spirally-shaped scraper 35, an arm 63, which is mounted on the lower end of a rotary shaft 64, is provided.

Fig. 8 shows a side view of the supply roller 21 on which

longitudinal grooves are provided.

Fig. 9 shows a side view of the supply roller 21 on which a spirally-shaped ridge is provided.

Explanation of the Preferred Embodiments

An embodiment of this invention is now explained by reference to various Figures.

Fig. 2 shows the apparatus of this invention. On a base B, a crust-material supply section 10, a filling-supply section 20, a material-joining section 30, a cutting section 40, and a conveyor section 50, are disposed. The conveyor section 50 includes a drive-roller 8 to be driven by a motor (not shown). The drive-roller 8 causes an endless belt 12 to advance in the direction indicated by an arrow N. The operations of the above sections are controlled by a controller 7.

The crust-material supply section 10 is provided with a screw mechanism 11 (see Fig. 4), and with a pumping mechanism 12 in front of the mechanism 11. The section 10 supplies a crust-material D1 through the screw mechanism 11 to the material-joining section 30. The filling-supply section 20, which supplies a filling D2, comprises a plurality of supply rollers 21. These are circularly disposed to enclose a funnel-shaped space that is surrounded by the supply rollers 21. The upper part of the funnel-shaped space is wide and the lower part of it is narrow.

As in Fig. 5, the supply roller 21 is provided with ridges 9. The

lower end of each supply roller 21 is supported by a support pin 23a that is mounted on a frame 23 of the filling-supply section 20. A rotating shaft 21a of the supply roller 21, disposed at the upper end of each supply roller 21, is rotatably supported by, and located at the upper part of, the frame 23. A gear 21b is provided on the rotating shaft 21a so as to engage a ring gear 21c. When a drive motor 22 is energized, its rotational drive force is transmitted through a rotating shaft 45, a gear 46, a gear 47, a rotating shaft 48, a gear 49, and the ring gear 21c, to the respective gears 21b, so that the supply rollers 21 are rotated in the same direction at the same speed.

As in Fig. 4, six supply rollers 21 are circularly disposed to form the funnel-shaped space. The central axis of each supply roller is caused to deviate from an imaginary line directed to the center of an imaginary circle formed by the surrounding supply rollers.

In Fig. 5, the material-joining section 30 comprises a housing 31 that includes a housing inner chamber 31a. A supply pipe 32 is disposed in the housing inner chamber 31a. The supply pipe 32 is located under the lower part of the funnel-shaped space that is surrounded by the supply rollers 21, so that the central axis of the supply pipe is concentric with that of the space.

An inlet for the housing inner chamber 31a is provided at the side of the housing 31. A crust-material passageway 13 (see Fig. 2), extending from the crust-material supply section 10, is connected to the inlet.

A rotation-ring 33 is inserted into an opening disposed on the lower

face of the housing 31 so that the axis of the rotation-ring 33 is concentric with that of the supply pipe 32. Also, the rotation-ring 33 is positioned to provide a predetermined gap, namely a ring-shaped gap C, between the rotation-ring 33 and the lower end of the supply pipe 32. The ring-shaped gap C is an outlet for the crust-material D1.

The rotation-ring 33 is provided with teeth 58 at its outer periphery and they engage a gear 57 mounted on the lower end of a rotating shaft 34. On the other hand, the rotating shaft 48 is provided at its lower end with a gear 51 which engages a gear 52. It is mounted on the upper end of a rotating shaft 54, on the lower end of which a gear 55 is mounted. It engages a gear 56 which is mounted on a rotating shaft 34. Therefore, when the motor 22 is energized, the rotation-ring 33 is rotated by the drive transmission through these gears.

The supply pipe 32 is provided at its upper and outer periphery with teeth which engage the gear 56. Therefore, when the motor 22 is energized, the supply pipe 32 is rotated by the drive transmission through these gears.

Inside the supply pipe 32, a spirally-shaped scraper 35 is disposed. As in Fig. 5, the upper end of the spirally-shaped scraper 35 is, separately from the supply pipe 32, fixed to the housing 31. Therefore, even when the supply pipe 32 is rotated, the scraper 35 does not rotate.

Below the operation of the apparatus is explained.

When the filling D2 is charged into the funnel-shaped space and the motor 22 is energized, the supply rollers 21 are rotated so as to apply forces in the circumferential direction to the filling D2. Therefore, the filling D2 is rotated in its circumferential direction while it is moved downward by its own weight.

As in Fig. 4, the central axes of the supply rollers 21 are caused to deviate from the imaginary lines directed to the center of the imaginary circle formed by the surrounding rollers. Therefore, the peripheral shape of the lower part of the funnel-shaped space is somewhat twisted. This twisting tends to accelerate the feeding actions of the rollers for a material charged into the funnel-shaped space. Therefore, the filling D2 can be fed downward more steadily compared to where the rollers are disposed so that their central axes are directed to the center of the circle.

In this embodiment the ridges 9 are provided on the surface of each supply roller. Therefore, the frictional engagement of the supply roller with the filling D2 can be enhanced, so that it can be steadily fed downward.

In place of the ridges, as in Fig. 8, the supply roller 21 can be provided with longitudinal grooves 60. Also, as in Fig. 9, a ridge 61 can be spirally shaped. These grooves 60 and ridges 61 can enhance the frictional engagement of the supply rollers with the filling D2, thereby steadily feeding it downward without slipping.

Below the operation of the scraper will be explained.

The filling D2 that is fed downward from the funnel-shaped space then

enters the supply pipe 32. Although the spirally-shaped scraper 35 does not rotate, the filling D2 is subjected to the feeding action downward due to the rotation of the supply pipe 32 and the spiral shape of the scraper 35. This is due to the movement of the supply pipe 32 relative to the scraper 35. This relative movement has a mixing action that stirs the filling D2. Therefore, the filling D2 that is discharged from the supply pipe 32 can be uniformly shaped. This leads, after the filling D2 is joined with the crust-material D1 to make a two-layered rod-like body, to it also having a uniform shape.

In place of the rotation of the supply pipe 32, the spirally-shaped scraper 35 can be rotated. To carry this out, as in Fig. 6, the upper end of the spirally-shaped scraper 35 is fixed to a ring gear 62 which engages the gear 56. Further, the engagement of the supply pipe 32 at its upper end with the gear 62 is released. Thus, the supply pipe 32 is adapted to be not rotated. When the motor 22 is energized the filling D2 is fed downward by the feeding action due to the spiral shape of the scraper 35. Also, in place of the scraper 35, as in Fig. 7, an arm 63 can be used. In this case the engagement of the supply pipe 32 at its upper end with the gear 62 is released. The arm 63 extends to a position adjacent the inner wall of the scraper 32 and further extends downward while it is bent, to form a spiral shape. The arm 63 is mounted on the lower end of a rotating shaft 64, the axis of which is concentric with that of the supply pipe 32. The shaft 64 is driven by a motor (not shown). When the motor 22 is energized the filling D2 is fed downward by the feeding action due to the spiral shape of the arm 63.

The spirally-shaped scraper 35 and the arm 63 are positioned adjacent

the inner wall of the supply pipe 32 or positioned so as to contact the inner wall of the supply pipe 32. Therefore, viscous materials, such as boiled rice materials adhering to the inner wall of the supply pipe 32, can be peeled off and fed downward. The scraper can be shaped so that when the supply pipe is rotated it can move over the entire area of the supply pipe 32. Therefore, the shape of a scraper is not limited to that of a spiral. For instance, a plurality of linearly-shaped scrapers, each as long as a supply pipe, can be fixedly mounted, at equal intervals, on the frame 23, so that they are positioned within the supply pipe, parallel with its axis. The scrapers can be provided so that they contact the inner wall of the supply pipe or so that they are positioned adjacent the inner wall.

The crust-material D1 fed from the crust-material passageway 13 (see Fig. 2) is supplied into the housing inner chamber 31a and discharged from the ring-shaped gap C (see fig. 5). The crust-material D1 discharged from the ring-shaped gap C and the filling D2 discharged from the supply pipe 32 are joined to form the two-layered rod-like body, and it is discharged from the material-joining-section 30 (see Fig. 5).

Usually when the apparatus of this invention is actuated, the rotation-ring 33 is rotated to apply a circumferential force to the outer periphery of the two-layered rod-like body so as to uniformly shape it.

As the cutting section 40 (see Figs. 2 and 3) positioned under the material-joining-section 30, the apparatus disclosed in Japanese Patent Publication No. 4-53453 (corresponding to U.S. Patent No.

5,223,277) can be used. That apparatus comprises an assembly consisting of at least three cutting members that each can be slidably moved so as to form a central hole. It is made to open or close so as to allow a food material to enter it and be cut. Six cutting members 41 are received in a case 42. A cutting member drive-pin 43a at one end of a drive rod 43 is mounted on one of the cutting members 41. The other end of the drive rod 43 is connected to one end of a swinging arm 44. The other end of it is swingably mounted on the base B. A cam-follower 44a is mounted on the middle part of the swinging arm 44 so that the cam-follower 44a engages the cam groove of a cam 44b. Therefore, when the cam 44b is rotated by a drive motor (not shown), the drive rod 43 is caused to advance or retract, alternately, thereby to open or close the hole of the assembly, thereby cutting the two-layered rod-like body discharged from the material-joining-section 30 to prepare a rod-like body unit of a predetermined length. The above movements are synchronized with those of the material-joining-section 30 by the controller 7. The rod-like body unit is then fed by the endless belt 12 in the direction indicated by an arrow N.

In the method and apparatus of this invention the grooves or ridges are provided on the surfaces of the supply rollers forming the funnel-shaped space. Therefore, the frictional engagement of the supply rollers with the food material is enhanced to thereby steadily feed the food material, such as the boiled rice materials or the rice dumplings covered by bean jam, without slipping.

In the apparatus for discharging a food material of this invention the supply pipe with the scraper is disposed under the food-material-supply section. This scraper is positioned adjacent the inner wall

of the supply pipe or positioned such that the scraper slidably contacts the inner wall of said supply pipe. Therefore, the food material, such as the boiled rice materials or the rice dumplings covered by bean jam, adhering to the inner wall of the supply roller, can be steadily peeled off therefrom.

When the scraper 35 is spirally-shaped, the movement of the supply pipe 32 in relation to the scraper 35 stirs the filling D2 in the supply pipe 32. Therefore, the filling D2 that is discharged from the supply pipe 32 can be uniformly shaped.

Claims:

1. A method of discharging a food material comprising circularly disposing a plurality of supply rollers to form a funnel-shaped space to receive said food material, charging it into said funnel-shaped space, and rotating said supply rollers so as to move said food material and to feed it downward, characterized by:

providing grooves or ridges on the surface of each supply roller to enhance the frictional engagement of said supply rollers with said food material, thereby steadily feeding it downward.

2. The method of claim 1, in which said grooves or ridges are spirally-shaped.

3. An apparatus for discharging a food material comprising a food-material-supply section which supplies a food material downward, said food-material-supply section comprising a plurality of rotatable supply rollers for supplying a food material downward, said supply rollers being circularly disposed so that they form a funnel-shaped space to receive said food material, characterized by:

each supply roller being provided with grooves or ridges.

4. The apparatus of claim 1, in which said grooves or ridges are spirally-shaped.

5. An apparatus for discharging a food material comprising a food-material-supply section which supplies a food material downward, said food-material-supply section comprising a plurality of rotatable supply rollers for supplying a food material downward, said supply rollers being circularly disposed so that they form a funnel-shaped

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space to receive said food material, characterized by:

a supply pipe disposed under said food-material-supply section, to make a passageway for the food material, said supply pipe being provided with a scraper for said food material so that said scraper is positioned adjacent the inner wall of said supply pipe or so that said scraper slidably contacts the inner wall of said supply pipe.

6. The apparatus of claim 5, in which either said supply pipe or said scraper is rotated.

7. The apparatus of claim 5 or 6, in which said scraper is spirally-shaped.

8. The apparatus of claim 5, 6, or 7, in which said scraper is provided with a shaft positioned along the central axis of said supply pipe and with an arm extending to a position adjacent the inner wall of said supply pipe.

9. The apparatus of claim 5, in which each supply roller is provided with grooves or ridges.