

Filled cups made of cereal ✓

The subject of the present invention is a method for preparing filled cups made of cereal and an installation for implementing the method.

5 EP0638239 (F. Paquier) describes a machine for the industrial manufacture of edible cups intended to contain foodstuffs, the machine cutting out individual pieces of dough from a possibly floured thinly-rolled dough, placing these pieces on a moulding former and
10 transferring them to a cooking oven.

EP0293552 (O. Nockemann) describes a method of preparing filled cups made of cereal, in which method forming is used to prepare cooked or dehydrated cereal cups with impervious and relatively elastic walls that
15 can be filled either with a culinary preparation in subdivided form or with a premoulded culinary preparation adapted to the size and shape of the inside of the cup, especially a frozen preparation intended to be reheated in a microwave once it has been slipped
20 into the cup.

EP0487757 (SOCIETE DES PRODUITS NESTLE S.A.) describes a method of cutting a cooked coextruded food product comprising a cereal-based outer case and any filling inside, in which method the product is cut by
25 pressing between two cylindrical surfaces while the outer case is still thermoplastic following cooking-coextrusion.

The object of the present invention is to propose a method of preparing filled cups made of
30 cereal continuously which allows a saving of any subsequent cooking or drying step to be made.

To this end, in the method of preparing filled cups made of cereal according to the present invention, cooking-extrusion is used to produce at least one flat
35 strip of cereal, hot-pressing is used to form at least one row of cavities in the extruded strip while it is still thermoplastic, transverse incisions are made in the strip between the cavities, a food filling is introduced into the cavities, the strip is cut
40 longitudinally while at the same time cutting off the



ends of the transverse incisions, and the individual filled cups thus obtained are collected.

Likewise, the installation for the implementation of the method according to the present invention comprises a cooking-extrusion device, a
5 hot-forming device, a transverse-incision device, a filling device and a longitudinal-cutting device. As a preference, the cooking-extrusion device comprises a twin-screw extruder the die of which has one or more
10 slit-shaped outlet orifices.

Surprisingly, the present method and the present installation do indeed allow a saving of any subsequent cooking or drying stage. This is because the flat strip of cereal is already cooked at the moment it
15 is formed by hot pressing, and the cups thus thermoformed are immediately filled and ready to be eaten without any subsequent cooking or drying operation any longer being required.

In this description, the expression "flat strip of cereal" is to be understood as meaning a strip of
20 flat cereal-based product, especially an expanded product based on cereal flour or semolina.

In order to implement the present method, it is possible to produce the flat strip of cereal by
25 cooking-extruding at 120-200°C at 6-15 MPa for 10-60 s in a twin-screw extruder a mixture or paste containing, in parts by weight, 70-90 parts of cereal flour, 1-15 parts of sucrose, 1-5 parts of oil or fat and 0.5-1.2 parts of sodium chloride, to which up to 15 parts of
30 water may be added, for example.

As a preference, the cereal used is wheat, corn, rye and/or barley. Up to 10 parts of oats can be incorporated in order to obtain a lighter product, for example.

35 Use can be made of all kinds of vegetable oils or fats, especially hydrogenated palm oil or coconut fat, for example.

Up to 3 parts of dextrose or fructose can be added to the mixture to make cutting easier, for example.

5 Up to 0.5 of a part of calcium carbonate can be added to the mixture to encourage the cooked-extruded strip to expand, for example.

Up to 8 parts of isolated or concentrated proteins, especially soya proteins, can be added to the mixture to make it easier for the product to coagulate,
10 for example.

The mixture may have a water content of 6-14% prior to the addition of water. Up to 15 parts of water can be added so that the mixture will have a water content of 10-25% prior to cooking-extrusion, of 8-12%
15 after cooking-extrusion and expansion, and of 3-6% after hot forming, for example.

The cooked mixture can be extruded by passing it through a die which has at least one slit-shaped outlet orifice 3-10 cm long and 0.4-1.5 mm wide, for
20 example. The extruded strip may then have a thickness of about 2-7.5 mm following expansion after it has been extruded through this die, for example.

The cavities can be formed by pressing the strip between the smooth-surfaced male and female mould
25 parts heated to a temperature of 60-90°C, for example. Smooth-surfaced male mould parts may be provided at the surface of an upper roll, and smooth-surfaced corresponding female mould parts may be provided at the surface of a lower roll of a forming device that
30 comprises one or more sets of superposed parallel rolls rotating in opposite directions. If the cavities to be formed need to have a certain depth, it may be preferable to form them in a number of passes between the male and female mould parts of increasing depth
35 that can be provided on several successive sets of rolls. It is also possible to envisage expelling the cups from the moulds under the effect of jets of air blown through a hole provided at the centre of the female mould parts and/or male mould parts of moulds,

at the moment when these female and male parts separate from one another.

As the strip may have a temperature of about 80-120°C as it leaves the extruder, it may be recommended for it to be passed, as close as possible to the die, between a first set of forming rolls heated to a temperature of at least 80°C, it being possible for a second or several subsequent sets of forming rolls to be heated to lower temperatures, or even not to be heated at all, it being possible for a final set of forming rolls even to be cooled, for example.

It is thus possible to form cavities which have a depth of 0.5-3 cm and a generally flat bottom measuring 4 to 30 cm², the shape of which may be contrived so that the cup is visually attractive while limiting as far as possible the volume of offcuts that result from the cutting of the strip, which offcuts are recycled preferably to the beginning of the cooking-extrusion process or into the filling, after appropriate conversion, for example.

It is then possible to introduce a filling into the cavities, in particular a savoury filling, especially a filling containing cheese or meat, or a sweet filling, especially a filling containing almonds, hazelnuts, expanded cereals, flakes of cereal, chocolate and/or jam, for example. The filling may be introduced in a single operation or in successive layers of different compositions, for example.

The choice of the precise composition of the paste of which the cereal cup is made may be dictated by the choice of filling composition. However, if the filling is too moist, namely if it has an Aw, especially an Aw of above 0.5, such that migration of moisture into the paste is a risk, it may be envisaged for the cavity of the cup to be rendered impermeable by spraying a starch solution into it and passing it under infrared radiation, for example. Complete coating of the cup by dipping or glazing, for example, may also be envisaged.

Once the filling has been introduced into the cavities, the cup can be closed with a pastry lid or with a hermetic layer such as a layer of sugar or of chocolate, for example.

5 The transverse incisions in the strip between the cavities can be made at any desired moment between the instant the strip leaves the die and the instant the strip is cut longitudinally, cutting off the ends of the transverse incisions just before the individual
10 filled cups obtained are collected.

 The installation for the implementation of the method therefore comprises a cooking-extrusion device, a hot-forming device, a transverse-incision device, a filling device and a longitudinal-cutting device, the
15 cooking-extrusion device preferably comprising a twin-screw extruder the die of which has one or more slit-shaped outlet orifices.

 The hot-forming device preferably comprises one or more sets of superposed parallel rolls rotating in
20 opposite directions, smooth-surfaced male mould parts being provided at the surface of an upper roll and smooth-surfaced corresponding female mould parts being provided at the surface of a lower roll. These rolls may be heated by the circulation of a heating fluid
25 inside the rolls, the heat being transmitted to the male and female mould parts by thermal conduction of the material of which the rolls are made, for example. A final set of rolls may even be cooled by the circulation of a cooling fluid, for example.

30 The transverse-incision device may comprise two superposed parallel rolls rotating in opposite directions, it being possible for the surface of an upper roll to have transverse cutters and it being possible for the surface of a lower roll to have
35 receiving and conveying cavities, for example.

 The filling device may comprise a feed hopper, distribution rollers and balancing means, for example.

 The longitudinal-cutting device may comprise two superposed parallel rolls rotating in opposite

directions, it being possible for the surface of an upper roll to have circular longitudinal cutters, and it being possible for the surface of a lower roll to have receiving and conveying cavities, for example.

5 The installation may further comprise a spraying device downstream of the filling device and/or a cooling tunnel upstream of the longitudinal-cutting device, for example.

10 The installation according to the present invention is described below with reference to the drawing appended by way of example, in which:

- Figure 1 diagrammatically depicts a side view of one embodiment of the installation,
- Figure 2 diagrammatically depicts a view from
15 above of the embodiment of the installation depicted in Figure 1, and
- Figure 3 depicts a view from above of various shapes of cup cut from the strip.

20 In the embodiment depicted in Figures 1 and 2, the present installation comprises a cooking-extrusion device (1), a hot-forming device (2), a transverse-incision device (3), a filling device (4) and a longitudinal-cutting device (5).

25 The cooking-extrusion device comprises a twin-screw extruder (1) the die (6) of which has three slit-shaped outlet orifices (7).

30 The forming device (2) comprises a set of superposed parallel rolls (20, 21) rotating in opposite directions, smooth-surfaced male mould parts (22) being provided at the surface of an upper roll (20) and smooth-surfaced corresponding female mould parts (23) being provided at the surface of a lower roll (21).

35 The transverse-incision device (3) comprises two superposed parallel rolls rotating in opposite directions, the surface of an upper roll (8) having transverse cutters (9) and the surface of a lower roll (10) having receiving and conveying cavities (11).

The filling device (4) comprises a feed hopper (12), distribution rollers (13) and balancing means (14).

5 The longitudinal-cutting device (5) comprises two superposed parallel rolls rotating in opposite directions, the surface of an upper roll (15) having longitudinal cutters (16) and the surface of a lower roll (17) having receiving and conveying cavities (11).

10 The installation further comprises a spraying device (18) downstream of the filling device (4) and a cooling tunnel (19) upstream of the longitudinal-cutting device (5).

15 As has been depicted in Figure 3 (the respective strips can be imagined as travelling upwards from the bottom of the figure), it is possible to cut from the strip blanks (24), the, for example, triangular, square, rectangular, S-shaped, chevron-shaped or arc-shaped, shape of which may be contrived so that the cups are visually attractive
20 while at the same time restricting as far as possible the amount of offcuts that result from cutting the strip.

The method according to the present invention is described in greater detail in the examples which
25 follow which are given by way of illustration and in which the percentages and parts are given by weight.

Example 1

Using an installation similar to the one depicted in Figures 1 and 2, slightly flared cups which
30 are 2 cm deep and have a rectangular bottom measuring 2 x 7 cm² are prepared.

In the twin-screw extruder of this installation, the residence time for the mixture is 30 s, the temperature 180°C and the pressure 8 MPa. The
35 die has three slit-shaped outlet orifices 7.5 cm long and 0.9 mm wide.

The forming device comprises three successive sets of rolls, on which the profiles have respective heights and depths of 1, 1.5 and 2 cm. The first set of

rolls is heated to 80°C, the second set of rolls is heated to 60°C and the third set is not heated.

The extruder is fed with a mixture containing 87.7 parts of wheat flour, 10.7 parts of white rye flour, 5 parts of isolated soya proteins, 2.8 parts of sucrose, 1.9 parts of corn oil, 0.85 of a part of sodium chloride, 0.48 of a part of calcium carbonate and 0.28 of a part of dextrose to which 4.7 parts of water are added. The mixture thus has a water content of 18.2% as it enters the device, 8.9% after expansion on leaving the extruder and 3% after hot forming.

The strip has a thickness of 4.5 mm after expansion, the thickness of the walls of the cup formed being about 1.5 mm.

The cups are filled with a cheese-based preparation which has an Aw of 0.5 comparable with that of their walls.

Example 2

The procedure followed is similar to the one described in Example 1, the exception being that the extruder is fed with a mixture containing 77.3 parts of wheat flour, 9.45 parts of white rye flour, 4.9 parts of isolated soya protein, 11.9 parts of sucrose, 2 parts of corn oil, 0.75 of a part of sodium chloride, 0.42 of a part of calcium carbonate and 2 parts of dextrose to which 5.5 parts of water are added. The mixture thus has a water content of 18% as it enters the device, 9.1% after expansion on leaving the extruder and 4% after hot forming.

The cups are filled with a first layer of roughly crushed hazelnuts, a second layer of hazelnut-chocolate cream and a third layer of puffed rice. The cups are closed with a layer of chocolate.

Example 3

The procedure followed is the one described in Example 2 to obtain cups which are then filled with a mixture of strawberries and hazelnuts on a caramel base and are then coated in chocolate.



Claims

1. Method of preparing filled cups made of cereal, in which method cooking-extrusion is used to produce at least one flat strip of cereal, hot-pressing is used to
5 form at least one row of cavities in the extruded strip while it is still thermoplastic, transverse incisions are made in the strip between the cavities, a food filling is introduced into the cavities, the strip is cut longitudinally while at the same time cutting off
10 the ends of the transverse incisions, and the individual filled cups thus obtained are collected.
2. Method according to Claim 1, in which the flat strip of cereal is produced by cooking-extruding at 120-200°C at 6-15 MPa for 10-60 s a mixture containing,
15 in parts by weight, 70-90 parts of cereal flour, 1-15 parts of sucrose, 1-5 parts of oil or fat and 0.5-1.2 parts of sodium chloride, to which up to 15 parts of water are added.
3. Method according to Claim 1, in which the
20 cooked mixture is extruded by passing it through a die which has at least one slit-shaped outlet orifice 3-10 cm long and 0.4-1.5 mm wide.
4. Method according to Claim 1, in which the cavities are formed by pressing the strip between the
25 smooth-surfaced male and female mould parts heated to a temperature of 60-90°C.
5. Method according to Claim 1, in which the cavities have a depth of 0.5-3 cm and a generally flat bottom measuring 4-30 cm².
- 30 6. Method according to Claim 1, in which the food filling is a savoury filling, especially a filling containing cheese or meat, or a sweet filling, especially a filling containing almonds, hazelnuts, expanded cereals, flakes of cereal, chocolate and/or
35 jam.
7. Installation for the implementation of the method according to one of Claims 1-6, comprising a cooking-extrusion device (1), a hot-forming device (2),



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a transverse-incision device (3), a filling device (4) and a longitudinal-cutting device (5).

8. Installation according to Claim 7, in which the cooking-extrusion device comprises a twin-screw extruder (1) the die (6) of which has one or more slit-shaped outlet orifices (7).

9. Installation according to Claim 7, in which the forming device (2) comprises one or more sets of superposed parallel rolls (20, 21) rotating in opposite directions, smooth-surfaced male mould parts being provided at the surface of an upper roll (20) and smooth-surfaced corresponding female mould parts being provided at the surface of a lower roll (21).

10. Installation according to Claim 7, in which the transverse-incision device (3) comprises two superposed parallel rolls rotating in opposite directions, the surface of an upper roll (8) having transverse cutters (9) and the surface of a lower roll (10) having receiving and conveying cavities (11).

11. Installation according to Claim 7, in which the filling device (4) comprises a feed hopper (12), distribution rollers (13) and balancing means (14).

12. Installation according to Claim 7, in which the longitudinal-cutting device (5) comprises two superposed parallel rolls rotating in opposite directions, the surface of an upper roll (15) having circular longitudinal cutters (16) and the surface of a lower roll (17) having receiving and conveying cavities (11).

13. Installation according to Claim 7, further comprising a spraying device (18) downstream of the filling device (4) and/or a cooling tunnel (19) upstream of the longitudinal-cutting device (5).