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71 Applicant: **DMV-CAMPINA B.V.**
NCB-Laan 80 P.O. Box 13
NL-5462 GE Veghel(NL)

72 Inventor: **Geers, Robert**
de Vlasakker 10
NL-5555 LH Valkenswaard(NL)

74 Representative: **Smulders, Theodorus A.H.J.**
et al
Vereenigde Octroolbureaux Nieuwe Parklaan
107
NL-2587 BP 's-Gravenhage(NL)

54 A method of, and apparatus for, slicing cheese, as well as slices obtained by using this method.

57 A method of slicing round cheeses, wherein a cylindrical portion is cut from the centre of the cheese and the resulting annular piece of cheese is divided into wedge-shaped portions by making radially extending cuts through the central axis of the cheese. Before or after the cutting away of the cylindrical central portion, the cheese is divided into at least two pieces, each being pressed with the face of the cylindrical hole against a semi-cylindrical guide and being rotated stepwise around said guide through a fixed, adjustable angle, while after each angular displacement, a wedge-shaped slice having a maximum thickness of 5 mm is cut off.

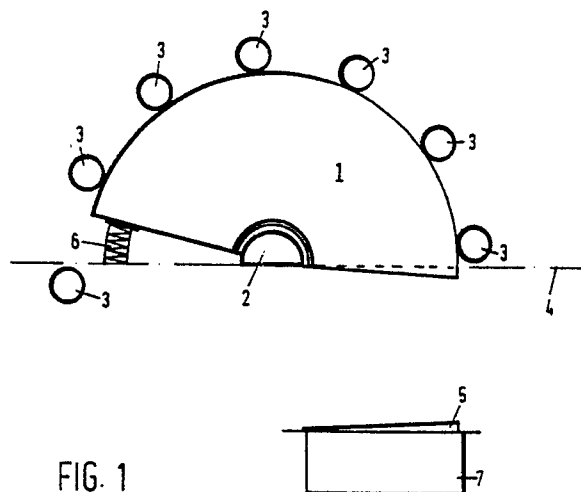


FIG. 1

A method of, and apparatus for, slicing cheese, as well as slices obtained by using this method.

Cheeses are prepared in many forms, usually, however, in a round form. This may be a more or less true sphere, slightly flattened on two sides, such as Edam type cheese, or a flat slice of round circumference, such as Gouda type cheese. This regular form is chosen traditionally for ease of handling, but also to obtain as uniform a salt distribution and ripening as possible. Angular forms give a higher salt content in the portions near the sharp edges during brining, and also the supply of oxygen and the like gases in the ripening period is stronger near a sharp edge than near a flat or curved surface. Salt and oxygen in that case can reach such a spot from two sides simultaneously.

For that reason, a Gouda type cheese mostly has not a true cylindrical form but one in which the cheese is a solid of revolution that is bounded by two flat planes perpendicular to the axis of symmetry.

The exterior is not parallel to the axis but has a rounded form. As used herein, a round cheese means a cheese having the form of a solid of revolution, such as an Edam type or Gouda type cheese.

It is conventional for a cheese with a round shape to be sliced by cuts in axial and radial direction, i.e. in a plane containing the axis of symmetry. Often, slicing also takes place transversely to such cutting planes to produce pieces of a size that can be easily handled, which are subsequently sold. The user can then cut these pieces to still smaller pieces.

Cheese used as a sandwich filling is cut into flat slices, starting from a flat or wedge-shaped piece. In general, a cheese plane, a blade or a slicer is used for slicing the cheese twice in a plane parallel to a boundary face of the piece of cheese. The cheese slices have a uniform thickness of only a few millimeters. An apparatus for thus slicing cheese is described in US patent 2,618,061.

An entirely round cheese or a wedge-shaped piece cut from it in the conventional manner cannot be divided into slices of the conventional flat form without losses. The dimensions of the slice as a matter of fact decrease according as the slice is more remote from the axis of symmetry of the cheese. Also the composition of the slices thus made is not constant, for near the rounded exterior, a cheese is saltier, drier and less tasty on an average than the cheese portions in the centre of the cheese. The end of the wedge-shaped piece of cheese, consequently, in this slicing method is always scrap, due to its inferior taste and unsuitable dimensions.

European patent application 0052409 describes the production of a round cheese having a central opening of round cross section. The purpose of this particular method of producing a cheese of deviant form is, on the one hand, to make a cheese that can be easily divided into wedge-shaped pieces and, on the other hand, the quicker ripening that could be achieved due to the central opening. This cheese could be cut into slices at the retailer's without slicing loss. As explained above, when the conventional parallel-slicing method is used, it is not possible to slice without loss.

A drawback of this method of producing cheeses of deviant form is that such a cheese requires special moulds and that the filling of the moulds and the subsequent ripening are standardized less well than with conventional cheese moulds. Besides, the cheese obtained has a considerably larger rind surface and an appreciably lower weight than a conventional cheese having the same outside dimensions, so that rind losses are higher than with a conventional cheese of the same diameter.

French patent 425,236 discloses a process for cutting round cheeses into wedge-shaped portions, wherein a cylindrical portion is cut from the centre of the cheese and the resulting annular piece of cheese is divided into wedge-shaped portions by making cuts extending radially through the central axis of the cheese. The cuts are made simultaneously by means of a cutting frame wherein a series of radial cutting wires are provided. The number of wedge-shaped portions that can be cut from a cheese is restricted by the number of wires that can be juxtaposed in the centre of the frame. This method moreover is only suitable for soft cheeses having a low cutting resistance. With cheeses having hard rinds, the forces to be exerted on the cutting frame become too high.

It is an object of the present invention to provide a method of slicing round cheeses without losses and wherein the above drawbacks are avoided. The method according to the present invention is characterized to that end in that the cheese, after cutting away the cylindrical central portion, is divided into at least two pieces, which are each pressed with the face of the cylindrical opening against a semi-cylindrical guide and are rotated around said guide stepwise through a fixed, adjustable angle, while, after each angular displacement, a wedge-shaped slice having a maximum thickness of 5 mm is cut off.

The cylindrical pieces can be marketed in that form, possibly cut into round slices, perpendicular to the axis of symmetry. The remaining ring can

subsequently be divided by radial and axial cuts into thin, wedge-shaped slices which are all identical, both in form and in composition.

Because the central portion has been removed from the cheese, the slice cut need not be of zero dimension at the thin end, so that even at the thin end still sufficiently thick sandwich filling is obtained. The ratio between the diameter of the cut-out cylinder and the outer circumference of the cheese determines the thickness ratio between the inner and outer edge of the cheese slice. If a smaller difference in thickness is desired, a larger inner cylinder is chosen. Since the quality of the inner cylinder in general is the most uniform one, this inner piece has a good commercial value, in contrast with the edge pieces, which remain in the conventional cheese slicing method. These edge pieces in general can only serve as raw material for process cheese.

The cutting away of the central cylindrical cheese portion has the advantage that a guide can be provided in the resulting hole, so that the piece of cheese can be driven for rotation around said cylindrical guide. The slicing member movable in a plane through the central axis of said cylinder can thus cut off wedge-shaped slices of the desired thickness when the piece of cheese, after each cut, is rotated further through a small angle.

European patent application 0093217 discloses a method and an apparatus for cutting round cheeses, wherein a cheese is placed on a table drivable stepwise in circumferential direction through a fixed, adjustable angle. During rotation of the table, a series of circular cuts are made in the cheese by means of a stationary cutting frame having a series of cutting edges provided perpendicular to the direction of rotation and the table. After the cheese has rotated through a given angle, a radial cut is made by means of a knife movable perpendicularly to the plane of the table to produce sectorial pieces of cheese, which are subdivided per sector into elongate blocks. The central portion of the cheese is then crumbled to a waste product that is unfit for use, or at least unmarketable.

The wedge-shaped slices cut according to the present invention may be stacked and packaged, slightly staggered relatively to each other, to a packet of some slices. These packets are easily stackable when the wedge-shaped slices are placed alternately in opposite directions, so that each packet gets a uniform height.

The present invention also relates to apparatus for slicing cheese, comprising a slicing member movable in a fixed plane. According to the present invention, such an apparatus is provided with a semi-cylindrical guide whose planar surface is located in the plane of movement of the slicing member. The apparatus further comprises means

for pressing a piece of cheese against the guide, as well as means for rotating the cheese after each cut through a desired angle. Such an apparatus is distinct over conventional slicing apparatuses for cheese, meat products and like products substantially in the manner in which the material to be sliced is conducted towards the cutting plane.

Naturally, the present invention is not limited to natural cheeses of round form but also process cheese products and imitation cheeses, prepared from fats and/or proteins other than those from milk, can be cut in that manner.

To ensure that the slices cut according to the present invention obtain a regular appearance even at the thin end, as desired by the users, the slices are cut in general not thinner than 1-0.5 mm. If the central cylinder is cut away to half the diameter of the cheese, the slice at the thick end becomes 2-1 mm in thickness. The cylinder then comprises $\frac{1}{4}$ part of the cheese. If the cylinder is chosen at $\frac{1}{3}$ of the diameter, the thickness of the slice ranges from 1-0.5 mm to 3-1.5 mm, while the central cylinder forms $\frac{1}{9}$ part of the cheese, etc.

With a slice whose thickness varies from 1-5 mm, the yield of cheese slices is 96% of the cheese, so that there remain 4% for the central cylindrical pieces. Since these central cylindrical pieces are quite fit for sale, the percentage of waste in the slicing method according to the present invention is 0%. When, as described in European patent application 0052409, the wedge-shaped pieces are conventionally cut to slices which are equally thick throughout the loss in a 25 cm diameter cheese is usually 0.5-1%.

One embodiment of the apparatus according to the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic front view of a slicer according to the present invention;

Fig. 2 is a top view of possible divisions of cheese into wedge-shaped slices.

The half-cheese 1 shown in Fig. 1 having a semi-cylindrical hole rests on a semi-cylindrical guide 2, while at the round side of the cheese, guide means 3, e.g. rolls or a hold-down belt, fix the piece of cheese. Naturally, these guide means are preferably constructed in such a manner that even a very thin piece to be divided with the last cut into two slices remains suitably gripped. A blade 4 rotatable in a horizontal plane slices a wedge-shaped slice 5 from the one end of the piece of cheese, after which a mechanism 6 for driving the cheese causes this to rotate through a desired angle, so that the next slice is given the correct thickness. The cut slices can be collected on a support 7, e.g. a small conveyor belt or weighing device, according to the manner in which

the slices are to be further used.

Fig. 2 shows a number of possibilities of how the round cheese can be divided. Cylindrical cuts 9a, b, c show how a larger or a smaller quantity of cheese can be previously removed from the centre. Radially and axially extending cuts 10a-f indicate how slices of different thickness can be cut. This varying thickness is realized by displacing the cheese 1 (Fig. 1) with the mechanism 6 after each cut through a larger or smaller angle in the direction of rotation.

Within broad limits, it is thus possible to selectively adjust the average thickness of the slice, the difference between the thickest and the thinnest part or the weight per slice by increasing or reducing the central cylinder and the angle through which the cheese is rotated after each cut.

Experience teaches that in general a thickness exceeding 5 mm no longer gives the slice of cheese the appearance desired for a slice of sandwich filling. A cheese having a diameter of 250 mm may e.g. be cut into 785 slices of a length of 62.5 mm and a thickness with a minimum of about 0.5 and a maximum of about 1 mm. Also, 160 slices can be chosen having a thickness of maximally about 5 mm and minimally about 2.5 mm. The accurate adjustment of the angle through which the cheese is rotated between two cuts enables the operator to realize a fixed weight per slice in case not all cheeses have the same form.

Claims

1. A method of slicing round cheeses, wherein a cylindrical portion is cut from the centre of the cheese and the resulting annular piece of cheese is divided into wedge-shaped portions by making radially extending cuts through the central axis of the cheese, characterized in that before or after the cutting away of the cylindrical central portion, the cheese is divided into at least two pieces, each being pressed with the face of the cylindrical hole against a semi-cylindrical guide and being rotated stepwise around said guide through a fixed, adjustable angle, while after each angular displacement, a wedge-shaped slice having a maximum thickness of 5 mm is cut off.

2. A wedge-shaped slice of cheese bounded by a portion of the exterior of a round cheese and three cutting planes, the first cutting plane being a cylindrical surface concentric with the axis of symmetry of the cheese, and the two other cutting planes being flat surfaces containing said axis of symmetry, spaced apart a maximum distance of 5 mm at the thick end of the slice of cheese.

3. A wedge-shaped slice of cheese as claimed in claim 2, characterized in that it has been obtained by the method of claim 1.

4. A method as claimed in claim 1, characterized in that the cut slices are placed alternately with the thick end in opposite directions.

5. A packet-like collection of slices of cheese produced by the method as claimed in claim 4.

6. An apparatus for applying the method as claimed in claim 1, comprising a slicer movable in a fixed plane, characterized in that the apparatus comprises a semi-cylindrical guide (2) whose flat surface lies in the plane of motion of the slicer (4), means (3) for pressing a piece of cheese (1) against the cylindrical face of said guide (2), as well as means (6) for rotating the piece of cheese (1) after each cut through a fixed, adjustable angle in the direction of the cutting plane.

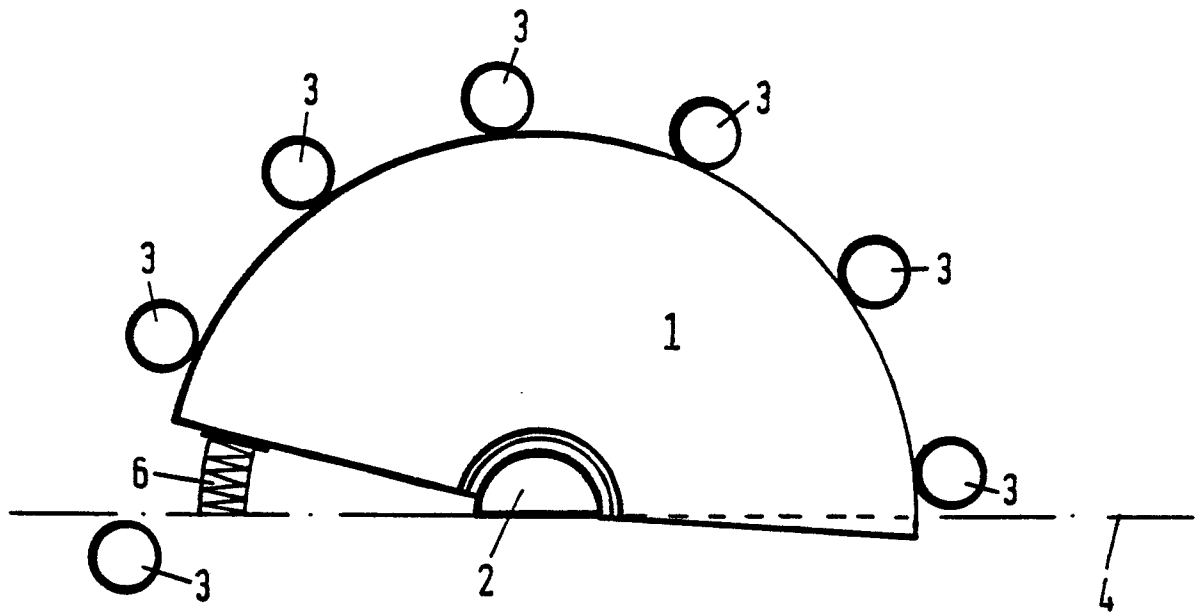


FIG. 1



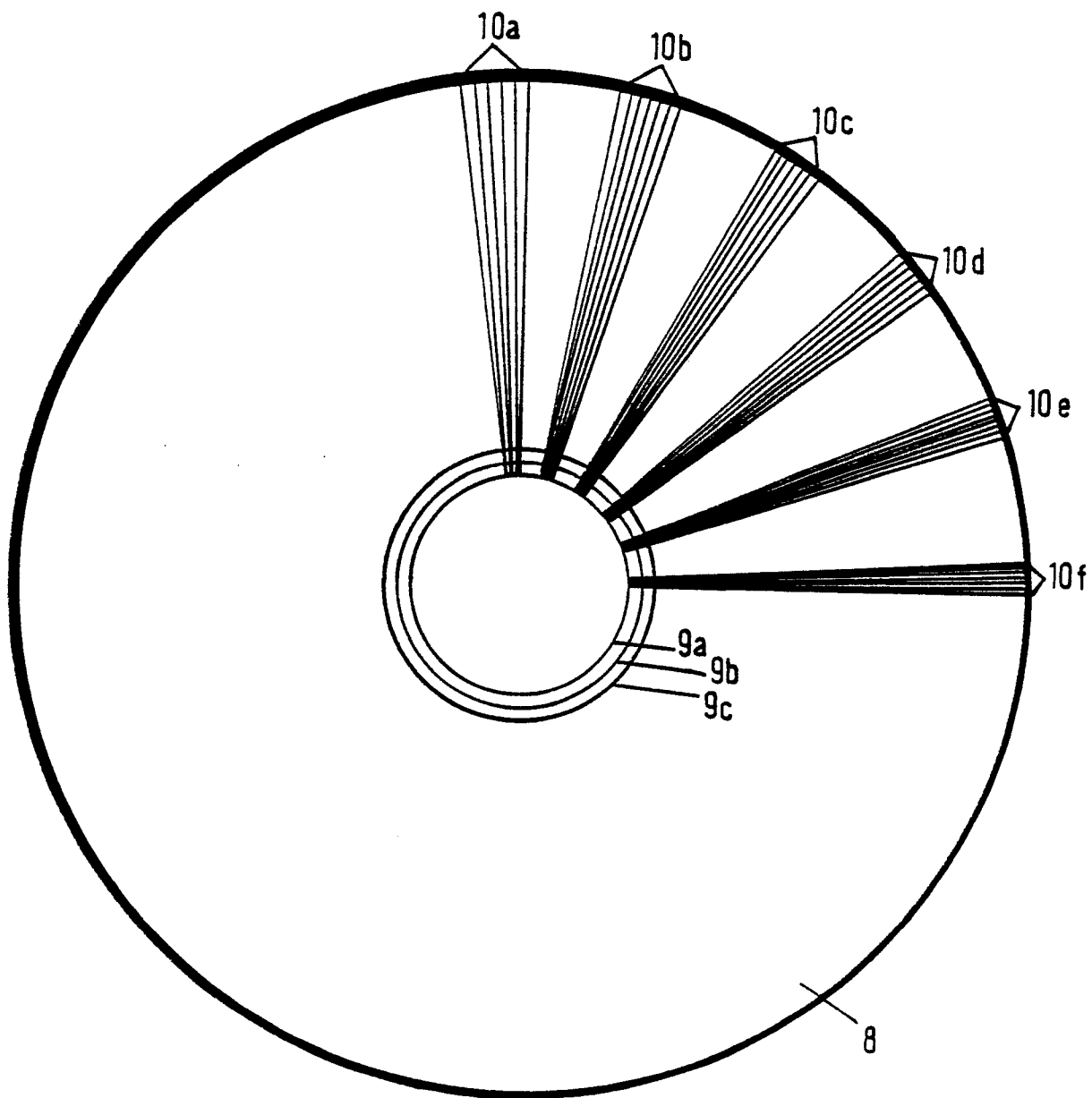


FIG. 2



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 20 0083

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X,D	FR-A- 425 236 (KLAUTSCHKE) * The whole document * ---	1-3	B 26 D 3/24 B 26 D 7/06
X,D	EP-A-0 093 217 (DELTEIL) * The whole document * ---	1,3	
A	US-A-4 064 990 (BENNETT) * The whole document * ---	4,5	
A	US-A-4 306 474 (ARENDS) * The whole document * ---	6	
A,D	US-A-2 618 061 (BEATTIE) ---		
A,D	EP-A-0 052 409 (HUISMAN) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			B 26 D A 01 J B 65 D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 04-05-1988	Examiner BERGHMANS H. F.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	