(19) DANMARK

(10) DK/EP 3536165 T3

(12) Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: *A 23 L 3/365 (2006.01)* *A 23 B 4/07 (2006.01)*

(45) Oversættelsen bekendtgjort den: **2021-07-26**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2021-05-26**

(86) Europæisk ansøgning nr.: **19159158.5**

(86) Europæisk indleveringsdag: **2019-02-25**

(87) Den europæiske ansøgnings publiceringsdag: **2019-09-11**

(30) Prioritet: **2018-03-07 DE 102018105265**

(84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

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(54) Benævnelse: **FREMGANGSMÅDE TIL OPTØNING AF FØDEVARER**

(56) Fremdragne publikationer:
EP-A1- 0 574 327
DE-U1-202010 000 603
Anonymous: "Massieranlagen / Massaging Systems- MAGNUM II SL/CSL", , 1. April 2016 (2016-04-01), Seiten 1-8, XP055602030, Gefunden im Internet: URL:http://www.compass-tr.com/static/files /inject-star/tumbler/magnum2-serisi/Magnum -II_Versand.pdf [gefunden am 2019-07-03]

Description

[0001] The invention relates to a defrosting process for foodstuffs, in particular meat, in accordance with the preamble of claim 1.

[0002] Conventionally, nowadays, foodstuffs are defrosted by heating them gently in a defrosting space over a relatively long period of time. This has the drawback that the foodstuffs are defrosted very slowly. Furthermore, liquid escapes from the foodstuffs during defrosting, resulting in loss of weight and economic loss. In addition, the escaped liquid contains components, by way of example proteins, which are then no longer available in the downstream processing processes. This can lead to product defects and a reduced product quality.

[0003] To counteract the drawbacks of the conventional defrosting process, what are known as tumblers are increasingly used for defrosting foodstuffs and in particular meat. In the tumblers, which have a rotating drum for the foodstuffs, the liquid occurring during defrosting is worked back into the product by virtue of the rotation and the resulting mechanical action on the foodstuffs.

[0004] By way of example, a tumbler has a double casing comprising fluid ducts. The fluid ducts may be flowed through by a heated liquid (salt water) to defrost the foodstuffs. In addition, heated water vapour may be introduced into the drum so as further to accelerate the defrosting process. The water vapour comes into contact with the surface of the foodstuffs over a large area, and thus provides uniform and rapid heating thereof. However, this has the disadvantage that, as a result of water vapour being supplied, liquid is supplied in the form of water. If the water penetrates into the foodstuffs, this results in a reduction in quality. Moreover, the subsequent processing processes can be impaired if the water mixes with the liquid which escapes from the foodstuffs during defrosting and creates abrasion on the product surface and/or in the container. Only a very small portion of the abrasion can be worked back into the product. In addition, it is perceived as a quality defect. Finally, the product having the abrasion may contaminate conveyor belts, filter systems or other processing systems during the further processing after defrosting.

[0005] DE 20 2010 000 603 U1 discloses a tumbler for a defrosting process for foodstuffs in which heated air circulates through the container and in which the heated air is removed from the container and, having been cleaned and/or sterilised by a filter and heated in a heating device, is fed back, recycled, into the container. Feeding back the heated air leads the risk of contaminating the foodstuffs with germs in this case.

[0006] The brochure Anonymous: "Massieranlagen / Massaging Systems – MAGNUM II SL/CL" of April 2016 specifies a tumbler which makes vacuum loading possible.

[0007] The object of the present invention is to specify an improved defrosting process for foodstuffs and in particular for meat.

[0008] To achieve the object, the invention has the features of claim 1.

[0009] The particular advantage of the invention is that, when heated air is supplied, the supply of liquid can be dispensed with, or at least the amount of liquid can be reduced, with the result that an undesirable input of foreign liquid into the product and the formation of an abrasion are counteracted. At the same time, the defrosting process takes place gently and rapidly, since the energy input is comparatively high and the heated air flows around the foodstuffs in the container uniformly.

[0010] According to the invention, it is in particular provided that the axis of rotation of the container is orientated at an inclination to the vertical. By way of example, the axis of rotation is provided extending horizontally. It may be provided that the supply opening for the heated air is provided on a first end face of the container and that the exit opening is provided on a second end face of the container opposite the first end face.

[0011] In the context of the invention, air is referred to as heated if the air supplied to the container is suitable, on the basis of the temperature of said air, for defrosting the foodstuffs provided in the container. If, by way of example, the foodstuffs are at a temperature of -18 °C and the ambient temperature outside the container is 20 °C, the heated air may be supplied at a temperature of by way of example 6 °C.

[0012] By way of example, the heated air may be pumped into the container via the supply opening. For discharging the heated air, by way of example an actuable valve may be assigned to the exit opening.

[0013] In a preferred embodiment of the invention, the heated air may be conveyed using a pump. In particular, by means of the pump, the heated air may be drawn through the supply opening into the container and sucked away through the exit opening. Advantageously, providing the pump and sucking the heated air through the container results in a setup which is both simpler and more robust in construction.

[0014] According to the invention, the container filled with the foodstuffs rotates about the axis of rotation while the heated air is drawn in and sucked away. Advantageously, simultaneously rotating the container and supplying and/or sucking away the air means that particularly effective mixing, and thus a simultaneously gentle and rapid defrosting process, are provided.

[0015] According to the invention, the heated air is simultaneously drawn into the container and sucked out of the container. Thus, according to the invention, a continuous and particularly rapid and/or economical defrosting process is created. In particular, it may be provided that the heated air is continuously drawn into the container and sucked out of the container.

[0016] According to the invention, fluid ducts are formed on the container on the outer face and are flowed through by a temperature-controlled liquid while the container filled with the foodstuffs rotates about the axis of rotation. In particular, the liquid can flow through the fluid ducts of the container while the heated air is drawn into and/or sucked out of the container. Advantageously, as a result of the container casing being fluid-heated and the heated air being supplied and/or sucked away simultaneously, the defrosting process can be further optimised. In particular, good temperature control can be provided if the two process features are combined.

[0017] According to the invention, the container is filled with the foodstuffs via the supply opening. In particular, the filling can take place by way of vacuum-loading. Air is then sucked out of the container through the exit opening using the pump, and as a result the foodstuffs are sucked in via the supply opening. For this purpose, a suction hose, via which the foodstuffs are sucked out of a provided receptacle, may be assigned to the supply opening. Advantageously, the container can be filled very rapidly by means of the vacuum-loading. The method according to the invention is thus particularly economical overall.

[0018] Further advantages, features and details of the invention may be derived from the further dependent claims and the following description. Features mentioned therein may be essential to the invention, each individually per se or else in any desired combination. The drawing merely serves to illustrate the invention by way of example. It is not limiting in nature.

[0019] In the drawing:

Fig. 1 is a sketch of an arrangement for carrying out the defrosting process according to the invention.

[0020] As essential functional components, the invention comprises a tumbler 1, a conditioning device 2 for heating air, a pump 3 and a liquid conditioning box 4. The tumbler 1 has a container 6, rotatable about a horizontally extending axis of rotation 5. The container 6 has a temperature-controllable double casing comprising a fluid duct 7 and mutually opposed end faces 8, 9. A rotary feedthrough 10 is assigned to a first end face 8. An inlet line 11 and a return line 12 for a liquid are provided from a liquid conditioning box 4 to the rotary feedthrough 10. The liquid, which is temperature-controlled in the liquid conditioning box 4 and passed via the inlet line 11 to the rotary feedthrough 10, subsequently flows through the fluid duct 7 of the tumbler 1 and arrives back at the liquid conditioning box 4 via the return line 12. The liquid can be heated or cooled in the liquid conditioning box 4 so as to flow through the fluid duct 7 at a

predetermined temperature. In particular the liquid conditioning box 4 may provide means for setting or changing the volume flow of the liquid.

[0021] A supply line 13 is further guided to the rotary feedthrough 10. The supply line 13 connects the rotary feedthrough 10 of the tumbler 1 to the conditioning device 2. Heated air is provided by the conditioning device 2. The heated air arrives in the container 6 of the tumbler via the supply line 13 and the rotary feedthrough, as long as the pump 3 is being operated and air is being sucked out of the container 6 by means of the pump 3 via a suction line 14 guided from the pump 3 to the tumbler 1.

[0022] So as to guide the heated air through the container 6, a supply opening 15 for the heated air is provided on a first end face 8, and an exit opening 16 is provided on the opposite, second end face 9. In particular, it may be provided that the supply opening 15 and the exit opening 16 are provided coaxial with the axis of rotation 5 of the container 6. The supply opening 15 may be assigned to the rotary feedthrough 10 of the tumbler 1.

[0023] To defrost foodstuffs, the container 6 of the tumbler 1 is filled with foodstuffs. Subsequently, the container 6 of the tumbler 1 is rotated about the axis of rotation 5 by means of a drive unit (not shown). The fluid duct 7 is flowed through by the temperature-controlled liquid, and in addition, by means of the pump 3, air heated by the conditioning device 2 is drawn into the container 6 and sucked out of the container 6. The foodstuffs in the container 6 are then rapidly and gently heated. At the same time, during the defrosting, liquid escaping from the foodstuffs is worked back into the foodstuffs again by virtue of the rotational movement, with the result that the constitution of the foodstuffs does not change or only changes very slightly during the defrosting.

[0024] During the defrosting, depending on the constitution of the foodstuffs and/or the amount, the defrosting process can be influenced or shaped, in particular, on the one hand, by selecting the amount and/or temperature of the heated air appropriately. On the other hand, the temperature and throughput of the liquid can be adapted by the fluid duct 7 of the container 6. It may in particular be provided that, to defrost the foodstuffs, air is passed through the container 6 and the fluid duct 7 is flowed through by the liquid

simultaneously. By way of example, either the liquid passed through the fluid duct 7 or the heated air may be used for the defrosting.

[0025] According to the invention, it may in particular be provided that the heated air is conveyed continuously through the container 6. Unlike the water vapour nowadays, the heated air is thus not supplied sequentially. It may further be provided that more than one fluid duct 7 for the liquid is provided on the container 6.

[0026] For filling the container 6, it may by way of example be provided that air is pumped out of the container 6 by means of the pump 3 and the foodstuffs are sucked into the container 6 via the supply opening 15. For this purpose, in particular a suction hose, which is guided in a provided receptacle for the foodstuffs, may be provided at the supply opening 15.

Patentkrav

1. Fremgangsmåde til optøning af fødevarer, især kød,
hvilke fødevarer fyldes i en beholder (6), der kan rotere omkring en rotationsakse (5) og som omfatter indbyrdes modstående endeflader (8), (9), og opvarmes og roteres efter beholderen (6) er fyldt, hvilken første endeflade (8) er tilordnet en første roterende gennemføring (10), hvor opvarmet luft til opvarmning af fødevarer tilføres beholderen (6) gennem en tilførselsåbning (15) og føres ud gennem en udgangsåbning (16), hvilken tilførselsåbning (15) til den opvarmede luft er tilordnet på den første endeflade (8) og udgangsåbningen (16) er tilvejebragt på en modsat anden endeflade (9), og hvilken tilførselsåbning (15) er tilordnet den roterende gennemføring (10), **kendetegnet ved, at**
der på beholderen (6) er tilvejebragt en temperaturregulerbar dobbeltkappe, som omfatter fluidkanaler (7) på kappesiden, der gennemstrømmes af en tempereret væske, at beholderen (6) fyldes med fødevarerne via tilførselsåbningen (15), at en fødeledning (11) og en returledning (12) til væsken er tilvejebragt til den roterende gennemføring (10) fra en væskekonditioneringsboks (4),
hvilken væske føres til den roterende gennemføring (10) via fødeledningen (11) og efterfølgende strømmer gennem fluidkanalen (7) og ankommer tilbage til væskekonditioneringsboksen (4) via returledningen (12), hvor væsken afkøles i væskekonditioneringsboksen (4), og at fluidkanalerne (7) på samme tid gennemstrømmes af væsken, og den opvarmede luft tilføres kontinuerligt til beholderen (6) og føres ud af beholderen (6), mens beholderen (6) der er påfyldt med levnedsmidlerne, roterer omkring rotationsaksen (5).

2. Fremgangsmåden til optøning ifølge krav 1, **kendetegnet ved, at** den opvarmede luft transporteres ved hjælp af en pumpe (3).

3. Fremgangsmåde til optøning ifølge krav 1 eller krav 2, **kendetegnet ved, at** den opvarmede luft trækkes ind i beholderen (6) gennem tilførselsåbningen (15) ved hjælp af pumpen (3) og suges væk gennem udgangsåbningen (16).

4. Fremgangsmåde til optøning ifølge et hvilket som helst af kravene 1 til 3, **kendetegnet ved, at** fødevarerne fyldes i og fjernes fra beholderen (6) via en fælles påfyldnings- og fjernelsesåbning, der er tilvejebragt på beholderen (6) ved en endeflade og fortrinsvis koaksialt med rotationsaksen (5).

5. Fremgangsmåde til optøning ifølge et hvilket som helst af kravene 1 til 4, **kendetegnet ved, at** levnedsmidlerne fyldes i beholderen (6) ved hjælp af vakuumpåfyldning, hvor der ved hjælp af pumpen (3) suges luft ud af beholderen (6) gennem udgangsåbningen (16), og fødevarerne suges ind.

6. Fremgangsmåde til optøning ifølge et hvilket som helst af kravene 1 til 5, **kendetegnet ved, at** den opvarmede luft suppleres og/eller trækkes koaksialt ud med rotationsaksen (5) og/eller at rotationsaksen (5) tilvejebringes med en hældning til lodret.

7. Fremgangsmåde til optøning ifølge et hvilket som helst af kravene 1 til 6, **kendetegnet ved, at** fødevarerne fyldes i beholderen (6) via den første endeflade (8) deraf og/eller fjernes fra beholderen (6) via den anden endeflade (9) modsat den første endeflade (8).

8. Fremgangsmåde til optøning ifølge et hvilket som helst af kravene 1 til 7, **kendetegnet ved, at** et konditioneringsapparat (2) er tilvejebragt til opvarmning af luften, hvilket konditioneringsapparat (2) fortrinsvis er tilvejebragt fjernt fra beholderen (6), og den opvarmede luft ledes fra konditioneringsapparatet (2) til tilførselsåbningen (15) via en tilførselsledning (13).

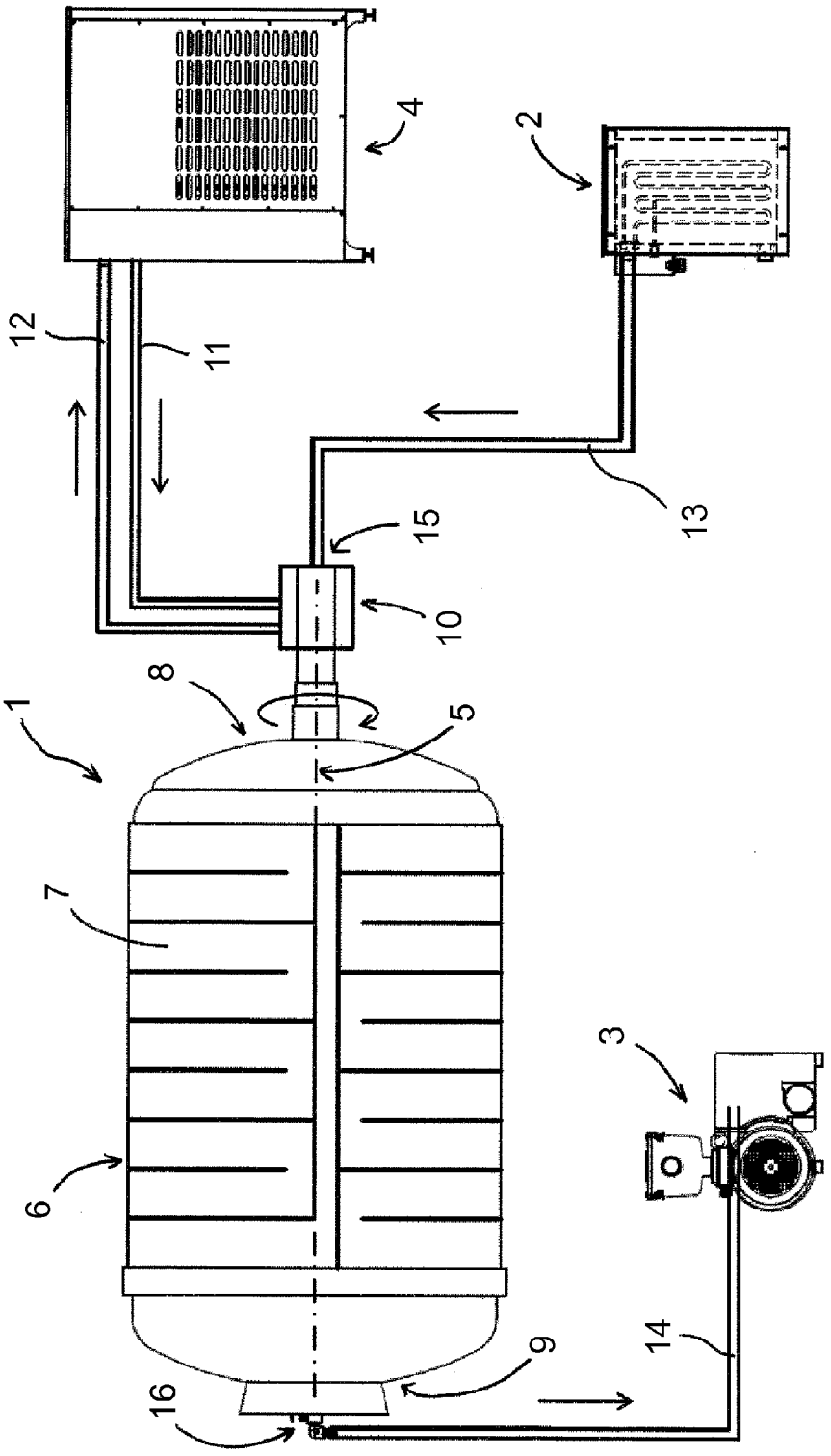

Fig. 1