

This invention relates to a grating disk with an essentially tubular inset provided with a straining device and being detachably connectible with the grating disk by means of a locking device, with the grating disk and the inset serving for insertion in a processing container, closable by a cover, of a multi-purpose food processor and being adapted to be coupled in a non-rotating relationship to a drive shaft extending into the processing container, consequently rotating in the interior of the processing container when the drive shaft rotates, with the grating disk having on its upper face close to the cover grater elements suitable for comminuting food materials, and with the cover providing a feed tube for inserting food materials, the end of the feed tube on the side close to the container extending down to the grating disk.

From FIG. 1 of DE-C-37 18 728 two grating disks are known (reference numerals 160 and 84) which are insertable in an approximately semi-circular recess of a disk mounting structure. These grating disks have small holes whose edges are provided with upwardly projecting sharp teeth forming the actual grater elements. These grating disks preferably serve the function of grating raw potatoes, with the pulpy mass thereby produced being discharged through the holes of the grater elements into the processing container.

A further grating disk for a multi-purpose food processor is known from Japanese Utility Model No. 57-19068. With this grating disk, preferably citrus fruits and other fruits and vegetables as horseradish or carrots, can be comminuted to a very fine texture. Further application possibilities are not provided with this grating disk.

The grater elements on the upper face of the grating disk described in Japanese Utility Model No. 57-19068 are provided by sharp teeth punched out of the surface, so that during the grating operation the grated material is moved outwardly on the surface of the grating disk, subsequently dropping through the annular clearance provided between the grating disk and the processing container to the bottom of the processing container. With this grating disk it is possible to comminute in particular very hard, firm and dry food materials as cheese and horseradish into particularly fine fibers.

Further, from CH-A-449 193 a grating disk is known having a centrifugal basket surrounding it, one function of the disk being to centrifuge fruit pulp, that is, to produce juice, while another function is the comminution of food materials using the grating disk without the centrifugal basket, that is, as a shredder unit. A non-rotative connection between the grating disk and the centrifugal basket is not provided in this specification.

Still further, from CH-A-318 753 a grating disk is known having an essentially tubular inset of the type initially described which is provided with a strainer device. By means of a thread device, the inset is detachably connected to the grating disk to be able to substitute an imperforate inset for the strainer device for the purpose of comminuting food materials. In order to obtain a sufficiently secure thread on both the inset and the grating disk, these parts have a sufficient number of threads in the threaded area to provide a secure and non-rotatably fixed connection resulting necessarily in a relatively tall construction of these parts.

Also, this arrangement makes assembly and demounting of the inset more difficult because, for one thing, assembly of the relatively large parts requires a great deal of dexterity to ensure proper meshing of the threads in the first place, and because, for another thing, much force needs to be expended in the demounting of the parts to be able to separate them from each other. The requisite force is due to the higher torque transmission on the thread, causing the two threaded parts to be twisted tight in relatively opposite directions during operation. To loosen the threaded connection, the use of special release keys is necessary to be able to overcome the high breakaway torque. Accordingly, the change from a centrifuging to a comminuting operation is a relatively complex procedure and therefore less suited for practical use.

It is an object of the present invention to devise a locking device between the grating disk and the inset which is simple, easy to manufacture and readily releasable without requiring the use of special tools, thus enabling a quick change from the one processing mode, that is, centrifuging, to the other processing mode, that is, grating.

According to the present invention, this object is accomplished by the features of the characterizing portion of patent claim 1.

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Following the production of juice, this solution enables the grating disk to be removed from the tubular inset particularly readily by turning the grating disk a small amount until it is disengaged from the bayonet-type lock. Subsequently, the grating disk can be lifted in an upward direction to be removed from the tubular inset. In the other mode when the grating disk is used alone in the processing container of a multi-purpose food processor, horseradish, shredded carrots, grated cheese or other foodstuffs shredded into fine fibers can be produced with particular ease as has been customary practice. In view of the dual function performed by the grating disk, an added effect results in that the initial cost is reduced while the range of applications is increased.

By arranging the means forming part of a locking device in the peripheral area of the grating disk it is possible to put the entire surface area of the grating disk to full use also when utilized as a spin juicer, because the locking device of the inset acts uniformly only on the perimeter of the grating disk. This is necessary to maintain a secure locking function also at high rotational frequencies without producing undesired out-of-balance conditions involving the risk of disengagement of the grating disk from the inset.

According to the features of claim 2, the grating disk snaps into the inset when in the locked position, so that in operation inadvertent disengagement of these parts is unlikely to occur. With the features of claim 3, the inset is centrally located on the grating disk in a simple manner.

By further developing the invention according to the features of patent claim 4, it is possible to provide on the grating disk an elaborately shaped engaging device in the form of an injection molding with ease, which adds to keeping the cost at a low level.

According to the features of patent claim 5, relatively high forces may be applied to the grating disk without the risk of deforming or even breaking the drive shaft. The good bearing stability can be further improved significantly according to the features of patent claim 6, so that also unavoidable out-of-balance conditions can be compensated for in an improved fashion.

In cases where the stem is formed of a plastic material, it is adapted to be connected to the grating disk by means of a further releasable locking device also when

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it is not injection-molded onto the grating disk directly (claim 7).

The further development of the present invention according to claim 8 results in a strainer basket retaining the pulp well while at the same time allowing the juice to be drained off rapidly. Further, such lamellae extending along the tubular inset can be cleaned with ease following removal of the strainer basket.

According to the features of patent claim 9, the provision of a special strainer basket can even be dispensed with, in which event, however, it is necessary for the tubular inset to be fabricated from metal instead of plastics.

The features of patent claim 10 result in a particularly wear-resistant grating disk withstanding also high bending stresses at all times. For the grating disk, a thickness in the range from 1 to 1.5 mm, approximately, has proved sufficient, enabling sufficiently robust grater elements to be formed out of the surface of the grating disk.

An embodiment of the present invention will now be described in more detail in the following with reference to the accompanying drawings. In the drawings,

FIG. 1 is a longitudinal sectional view of a processing container showing the tubular inset and the grating disk of the present invention in threaded engagement therewith by means of a bayonet-type locking device;

FIG. 2 is a longitudinal sectional view of a processing container in the center of which only the grating disk illustrated in FIG. 1 is journaled, the grating disk serving to process horseradish, grate cheese or shred similar food materials into fibers, in addition to serving to produce snowy ice from ice cubes;

FIG. 3 is a longitudinal sectional view of the tubular inset illustrated in FIG. 1;

FIG. 4 is a top plan view of the tubular inset of FIG. 3; and

FIG. 5 is a partial top plan view of the grating disk of FIG. 2.

To avoid repetitions, like reference numerals designate like parts throughout the Figures 1 to 5 so that in the Figures 2 to 5 only the details differing from those of FIG. 1 are referred to.

In FIG. 1, a processing container 1 having a manipulating handle 2 is shown, with a tubular inset 4 being introduced into the container opening 3 from above such that a hub 6 provided in the center 5 of the tubular inset 4 and representing the stem of a grating disk 25 sits on the forward end 8 of a drive shaft 9 of hexagonal cross-section. In this arrangement, the lower end of the tubular inset 4 engages the annular chamber 47 formed by the perimeter 54 of the grating disk 25 and the inner wall 49 of the processing container 1. Provided beneath the processing container 1 is a base of a multi-purpose food processor (not shown) into which the drive shaft 9 extends and in which the drive shaft 9 is drivingly connected with an electric motor (not shown) through a gear arrangement equally not shown in the drawings.

In order to be able to centrally locate the processing container 1 on an appliance base not shown in FIG. 1, a circumferential ring 11 is formed beneath the bottom 10 of the processing container 1. In its center area, the processing container 1 includes a tubular section 13 projecting from the bottom 10 into the container interior 12 and having a bore 7 receiving the drive shaft 9 which in FIGS. 1 and 2 projects upwardly beyond the free end 14 of the tubular section 13.

According to FIGS. 1 and 2, the hub 6 has a central bore 16 in which a cylindrical pin 15 fabricated from metal is secured as by press-fitting, adhesive bonding or similar fastening means. A centering sleeve, not shown in the drawings, may be substituted for the cylindrical pin 15. At its upper free end 17 when viewing FIGS. 1 and 2, the cylindrical pin 15 is rotatably journaled within a centering sleeve 18 which is part of a cover 19 sealingly closing the opening 3 of the processing container 1 at location 20. The cover 19 is securely, yet readily releasably, connected to the processing container 1 using a first bayonet-type locking means 21.

In FIG. 1, the tubular inset 4 has in its bottom area 22 a circumferential trough 23 extending on the outer periphery and having secured to its inner ring 42, by means of a second bayonet-type locking means 24 shown in more detail in FIGS. 3 and 4, an annular grating disk 25 provided with protruding grater elements 27 in the form of sharp teeth punched out of the surface 26 using

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a non-chip-forming operation. On the radially inner rim 28, the grating disk 25 includes a bore 62 fixedly connected with the hub 6 together with the rim 28 by reason of the fact that the hub 6 is injection-molded onto the rim 28 from above and below by means of annular projections 29, 30, with the annular section 63 which connects the projections 29, 30 engaging within the bore 62. In order to establish a still more intimate connection between the hub 6 and the grating disk 25, the radially inner rim 28 may be provided with additional bores (not shown) extending through the grating disk 25, into which bores the plastic material of the hub 6 flows during the injection-molding operation.

According to FIG. 1, a strainer basket 31 fabricated from a plastic material is seated in the tubular inset 4 and adapted to be fixedly connected with the tubular inset 4 by means of a third bayonet-type locking means 32. The strainer basket 31 is provided with lamellae 33 projecting down to the bottom 34 of the trough 23 and spaced from the inner wall 35 of the tubular inset 4 by a very small distance only (not shown in the drawings). The lamellae 33 extend substantially parallel to the inner wall 35 which in turn extends substantially parallel to the center line 5. The relative distance of adjacent lamellae 33 being small, very narrow longitudinal slots 36 result enabling the centrifuged juice to be discharged from the inner chamber 37 outwardly to the inner wall 35 of the inset 4, while the pulp is retained by the lamellae 33.

According to FIGS. 1 and 2, the cover 19 is provided with a feed tube 38 extending into the inner chamber 37 of the container 1 and receiving a pusher 39 therein. With its free end 40, the feed tube 38 terminates short of the ends of the grater elements 27, so that between the end 40 of the feed tube 38 and the ends of the grater elements 27 on the grating disk 25 a narrow annular clearance 41 results which is dimensioned as small as possible so that when fruits are engaged against the upper face 26 of the grating disk 25 by means of the pusher 39, the remaining fruit bits are prevented from passing through the annular clearance 41 unless they have been comminuted completely.

In FIG. 1, the hub 6 is engaged between the drive shaft 9 and the centering sleeve 18 which is a fixed part of the cover 19 and thus of the processing container 1 which is centrally located on the base (not shown) of the multi-purpose food processor as is the drive shaft 9. The hub 6 carries the grating disk 25 carrying in turn on

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its radially outer rim the tubular inset 4 by means of the second bayonet-type locking means 24, the inset thus combining with the grating disk 25 to form an upwardly open receptacle 61.

Referring to FIGS. 3 to 5, there is shown in greater detail an embodiment of the second bayonet-type locking means 24 illustrated in FIG. 1 only approximately. The second bayonet-type locking means 24 is comprised of locking tabs 50 integrally formed on the inset 4 and projecting upwardly from the radially inner ring 42 of FIG. 3, the tabs being uniformly distributed on the circumference of the radially inner ring 42 and combining with the end surface 51 to provide a slot 52 which serves to receive the peripheral area 53 of the grating disk 25 (FIG. 5).

In FIGS. 3 to 5, the perimeter 54 of the grating disk 25 is provided with cutouts 55 corresponding in number to the locking tabs 50 and having a circumferential length  $h$  slightly greater than the circumferential length  $g$  of the locking tabs 50. This serves to ensure that when the grating disk 25 is placed into the ring 56 surrounded by scrapers 44 and centrally locating the grating disk 25 on its perimeter 54, the cutouts 55 surround the locking tabs 50 until rotation of the grating disk 25 in a clockwise direction  $U$  causes the peripheral areas 53 to engage within the slots 52 to be securely retained therein by the locking tabs 50. In this locked position, knobs 57 projecting from the upper face 26 of the grating disk 25 are in engagement with corresponding notches 58 formed on the locking tabs 50.

Because the tubular inset 4 is equally driven in a clockwise direction  $U$  by the grating disk 25, in FIGS. 3 and 5 the trailing edges 59, when viewed in the direction of rotation, abut the stops 60 formed at the ends of the slots 52, thereby compelling the tubular inset 4 to follow the grating disk 25 in rotation.

The grating disk 25 connected with the tubular inset 4 operates as follows according to FIG. 1:

When the drive shaft 9 is caused to rotate by the drive motor, not shown in the drawings, of the multi-purpose food processor, it will drive the hub 6 through its engaging device 43 configured as a hexagon, the hub rotating in turn the grating disk 25 fixedly connected therewith as well as the tubular inset 4 connected to the grating disk 25 by means of the second bayonet-type locking means 24.

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According to FIG. 1, fruits fed through the feed tube 38 will meet the upper face 26 of the grating disk 25 and be processed by the grater elements 27 to fruit pulp. By virtue of the high rotational frequency at which the grating disk 25 and the tubular inset 4 rotate, the fruit pulp is discharged outwardly through both the scrapers 44 extending upwardly on the radially inner ring 42 and the passageways 45 formed by the scrapers 44 (FIGS. 3 and 4), until it strikes against the lamellae 33 slowing it down in a radial direction.

Then the juice is centrifuged from the fruit pulp, exiting through the longitudinal slots 36 and reaching the inner wall 35 where the succeeding flow of juice forces it to the upper rim 46 in FIG. 1 to subsequently enter the annular chamber 47 formed by the receptacle 61 and the processing container 1 and collecting at the bottom 10 of the processing container 1, while the pulp remains on the inner wall 48 of the lamellae 33. The greater the amount of fruit pulp centrifuged, the thicker the layer (not shown) accumulating on the inner wall 48 and growing in the direction of the center 5, and the higher the quantity of juice flowing into the processing container 1. When the inner wall 35 of the tubular inset 4 extends upwardly in a conically widening fashion, the juice will be discharged from the receptacle 61 still more readily.

The arrangement of FIG. 2 differs from that of FIG. 1 only in that when the tubular insert 4 with its grating disk 25 and its hub 6 is removed from the processing container 1 after lifting the cover 19, when the parts are cleaned and the juice is removed from the processing container 1, it can be used for another operation completely different from juice extraction, as, for example, for producing grated cheese or even snowy ice from ice cubes.

To remove the tubular inset 4, the hub 6 connected to the grating disk 25 is turned, whereby the grating disk 25 is detached from the inset by disengagement of the second bayonet-type locking means 24. Then only the hub 6 with the grating disk 25 attached is placed into the processing container 1 and coupled to the drive shaft 9 by means of the engaging device 43.

The mode of operation of the grating disk 25 employed without the tubular inset 4 is as follows:

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When the cover 19 is locked down onto the processing container 1, food materials such as pieces of cheese, horseradish, ice cubes, etc. can be put into the feed tube 38 and engaged against the grating disk 25 by applying pressure to the pusher 39, such that also particularly hard food materials are grated into very fine fibers by the grater elements 27 with the grating disk 25 rotating at high speed, the centrifugal force then acting to cause the grating disk 25 to expel the fibers radially outwardly against the inner wall 49 of the processing container 1 where they drop to the bottom 10 of the processing container 1. In this manner, the grating disk secured to the hub 6 (see FIG. 2) is in a position to grate food materials for the production of, for example, baby food (purée), grated cheese, chocolate, spices or even snowy ice, etc.

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Patent Claims:

1. A grating disk (25) with an essentially tubular inset (4) provided with a straining device (31) and being detachably connectible with the grating disk (25) by means of a locking device (24), with the grating disk (25) and the inset (4) serving for insertion in a processing container (1), closable by a cover (19), of a multi-purpose food processor and being adapted to be coupled in a non-rotating relationship to a drive shaft (9) extending into the processing container (1), consequently rotating in the interior of the processing container (1) when the drive shaft (9) rotates, with the grating disk (25) having on its upper face (26) close to the cover (19) grater elements (27) suitable for comminuting food materials, and with the cover (19) providing a feed tube (38) for inserting food materials, the end of the feed tube on the side close to the container extending down to the grating disk (25),

characterized in that the locking device (24) is comprised of a bayonet-type lock (50, 55) formed between the inset (4) and the grating disk (25), the lock providing on the one side locking tabs (50) uniformly distributed on a ring (42) of the inset (4) and provided with slots (52), and comprising on the other side projections (53) projecting from the outer periphery of the grating disk (25), the projections engaging in turn within the slots (52) of the locking tabs (50) when in the locked position, with the trailing edges (59) of the grating disk (25), when viewed in the direction of rotation (U), then abutting stops (60) of the slots (52).

2. The grating disk with inset as claimed in claim 1, characterized in that with the grating disk (25) and the inset (4) in the locked position, a knob (57) projecting from the upper face (26) of the grating disk (25) is in engagement with a corresponding notch (58) formed on the locking tabs (50).

3. The grating disk with inset as claimed in claim 1, characterized in that the perimeter (54) of the grating disk (25) is centrally located on a ring (56) provided on the inset (4).



4. The grating disk with inset as claimed in claim 1, characterized in that the grating disk (25) is provided with an engaging device (43) configured as a stem (6), and that the stem (6) is fabricated from a plastic material injection-molded onto the center of the grating disk (25).

5. The grating disk with inset as claimed in claim 4, characterized in that the stem (6) has its end remote from the grating disk (25) rotatably journaled on the cover (19).

6. The grating disk with inset as claimed in claim 5, characterized in that a cylindrical pin (15) fabricated from metal is secured within the stem (6), the pin engaging a centering sleeve (18) provided on the cover (19).

7. The grating disk with inset as claimed in claim 4, characterized in that the stem (6) is connectible with the grating disk (25) by means of a further releasable locking device, preferably a bayonet-type locking means which engages within a bore (28) provided in the center of the grating disk (25).

8. The grating disk with inset as claimed in claim 1, characterized in that the straining device (31) is comprised of a strainer basket inserted into the tubular inset (4) and provided with lamellae (33) relatively spaced by a very small distance and projecting down to the lower end of the inset (4), the lamellae (33) being spaced from the inner wall (35) of the inset (4) by a very small distance.

9. The grating disk with inset as claimed in claim 1, characterized in that the straining device is comprised of straining holes of a very small cross-section formed in the inset (4), and that the inset is manufactured from stainless metal.



10. The grating disk with inset as claimed in any one of the preceding claims, characterized in that the grating disk (25) is manufactured from metal, preferably high-grade steel, and that the grater elements (27) are arranged on the upper face (26) of the solid grating disk (25) in a uniform pattern, and that the grater elements (27) are formed by raised chips punched out of the upper face (26) of the grating disk (25).

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