FIG 2

Abstract: The invention provides a cutter plate (10), for use in a food processor. The plate (10) comprises a supporting disc (16) that is intended to rotate about its natural axis (22) which, in operation, coincides with the upright central axis of a food processor bowl (40). The disc supports a food processing blade comprising a cutting member (18), typically in the form of a second disc, which rotates relative to the supporting disc (16) about an axis (20) that is parallel to, but laterally offset from, the natural axis (22) of the supporting disc (16). By this means, the cutting member (18) is bodily rotated about the natural axis (22) of the supporting disc (16) whilst spinning about its own rotational axis (22) and thus effects combined chopping and slicing actions for improved food processing.

The rotational drive for the cutting member (18) may be provided by means of a belt and pulley system (24, 28, 32) coupled to a drive shaft (60) for the supporting disc (16).
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FOOD CUTTER PLATE

This invention relates to discoidal cutter plates for use in food processors.

Conventional cutter plates used for chopping or otherwise comminuting foodstuffs in the bowl of an electrically powered food processor comprise a blade, which may be curved or straight, that is pressed out of or fixedly secured to a flat, metallic disc which is mounted near the top of the bowl and is rotated rapidly within the bowl so that the blade cuts through food introduced via a feed-tube in the lid of the bowl. The food thus chopped typically falls into the bowl through an aperture, formed between the disc and the blade.

Many blade configurations have been utilised in such arrangements, and most work quite well, but none has proven entirely satisfactory in operation.

The present invention aims to provide an improved cutter plate.

According to the invention there is provided, in or for a food processor, a cutter plate comprising a discoidal support member adapted to be driven in rotation about its natural axis and bearing a cutting member mounted for rotation thereon about a second axis, disposed substantially parallel to but radially spaced from said natural axis; said cutter plate further comprising drive means adapted to drive said cutting member in rotation about said second axis when the support member is driven in rotation.
about its natural axis. This provides an active cutting surface which is beneficial in cutting, slicing or chopping certain foodstuffs.

In preferred embodiments of the invention, the cutting member is discoidal and the aforementioned second axis is the natural axis of the cutting member. This configuration provides an arrangement which operates smoothly and reliably and with an efficient slicing action.

It is preferred that the cutting member has a blade surface which repeatedly slices through foodstuffs urged on to the support member as it moves bodily about the natural axis of said support member and in rotation about said second axis.

The blade surface may preferably be serrated to enhance the slicing efficiency. Alternatively, the blade surface may be facetted or sinuous.

In some preferred embodiments, the drive means incorporates a drive belt extending from a driving pulley mounted at a central region of said support member to a driven pulley mounted at a central region of said cutting member. This provides a robust, economic and efficient means of transmitting the desired drive to the cutting member.

Conveniently, the support member is adapted to be driven from a drive shaft of a food processor, with the drive shaft extending along the natural axis of said support member.
In preferred embodiments of the invention, an aperture is formed in said support member providing part at least of a gap through which foodstuffs sliced by said cutting member can fall into a food processing bowl.

It is envisaged that an underside of said support member may bear a downwardly dependent distribution means adapted to redistribute foodstuffs accumulating in the bowl and approaching said underside of the support member.

In order that the invention may be clearly understood and readily carried into effect, one embodiment thereof will now be described, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 shows an underside view of the discoidal support member of a cutter plate in accordance with one embodiment of the invention, to illustrate its splined drive hub;

Figure 2 is an exploded diagrammatic representation of the major components of the cutter plate of Figure 1;

Figure 3 shows a plan view of the cutter plate, indicating the directions of rotation about their respective axes of the discoidal support member and the cutting member;

Figure 4 shows a sectional view through the cutter plate to illustrate the gap or clearance, between the cutting member and the discoidal support member, which determines slicing thickness; and
Figure 5 shows, in perspective and exploded diagrammatic form, certain elements of a food processor relevant to this invention, to illustrate how the cutter plate might be mounted and used in practice.

Referring now to the drawings, Figure 1 shows a perspective view from the underside of a cutter plate 10 in accordance with one embodiment of the invention. This view primarily illustrates the downwardly extending boss 12 of the plate, which is splined internally, as shown at 14, to mate with a splined drive shaft (not shown) upstanding from a drive outlet of a food processor (not shown) and which extends vertically through the centre of a mixing bowl (not shown) of the food processor. The cutter plate 10 typically comprises a discoidal support member 16 which is thus driven, by the food processor's drive shaft, about its natural axis.

It will be appreciated that references herein to the natural axis of rotation of a discoidal member such as 16 relate to an axis passing through the centre of the member and oriented at right angles to the member's plane.

The member 16 comprises a disc which may be made of metal, such as stainless steel, or may be made of any suitable food-grade plastics material. In any event, and as shown in Figure 2, for example, the disc 16 supports a cutting member, in the form of a second disc 18, which is smaller than the disc 16 and is rotatable relative thereto about an axis 20 which is parallel to but radially offset from the natural axis 22 of the disc 14. Disc 16 thus constitutes a cutting member which slices through foodstuffs as it rotates about its own natural axis 20 whilst being bodily rotated about the natural axis 22 of the disc 16; this latter axis coinciding
with the central upright axis of the bowl of the food processor and its main drive shaft.

The cutting member constituted by disc i8 is, in this embodiment of the invention, fixed to a driven pulley 24 which is supported by a bearing 26 on the disc 16. A driving pulley 28 is mounted independently of the disc 16, but located concentrically to it. The driving pulley 28 is driven by a shaft which passes through the centre of the disc 16, locating on a drive peg 30. The motion is transmitted from the driving pulley 28 to the driven pulley 24, and thus to the cutting disc 18, by means of a toothed belt 32. Alternative drive systems can of course be used, if preferred, to rotate the disc 18 relative to disc 16.

The drive ratio is, in this embodiment, 1:1. As the central drive shaft typically rotates at a ratio of 3:1, with respect to the rotation of the supporting disc 16, the cutting disc 18 thus rotates at a ratio of 3:1 with respect to the disc 16 which, as previously mentioned, is located on, and driven by way of, its splined drive hub 14 (Error! Reference source not found.).

Referring now to Figure 3, arrow 34 indicates the rotation of the disc 16 around its natural axis 22; a motion which carries the disc 18 bodily in a clockwise direction around axis 22, and arrow 36 indicates the rotation, also clockwise in this example, simultaneously executed by the disc 18 about its own natural axis 20. This Figure, and Figure 4, also show the gap 38 through which chopped and sliced foodstuffs can fall into the food
processor's bowl. The arrow 40 on Figure 4 indicates the relative direction of cutting with respect to the foodstuffs.

It will be appreciated from the foregoing that the invention provides a cutting member 18, rotating about its own natural axis 20, which is also rotated at a distance around the natural axis 22 of a discoidal supporting member 16, and that the axis 22 passes through the centre of the food processor's bowl and runs perpendicular to its base. The axis 22 also coincides with the axis of the food processor's drive shaft, which is utilised to drive the cutter plate 10 in the manner described.

In operation, when the supporting discoidal plate 16 is driven in rotation about its own natural axis 22, the cutting member 18 rotates about its axis 20, causing its cutting edge to continually move laterally across the face of the presented foodstuff, thus generating a slicing action. At the same time, the cutting member 18 is carried bodily forwards through the foodstuff, by the rotation of the discoidal support plate 16 about axis 22 (also the centre axis of the bowl and the axis of the food processor's drive shaft), thus generating a chopping action.

It will be appreciated that, if the cutting member 18 did not rotate, then the overall action of the plate 10, when rotated bodily about the bowl central axis 22, would be similar to that of a standard cutting blade, i.e. primarily a chopping action.

The rotating cutting member 18 is preferably disposed in the same plane as that of the conventional chopping blade, in which case the bodily
rotation of the cutter member 18 about the axis 22 is on the same plane as that of a conventional chopping blade.

The action of the cutting member 18 is similar to that of a bacon slicer and its usage has the aim of improving cutting performance, particularly on soft foods, fibrous foods, and foods like tomatoes, with tough skins surrounding a pulpy interior.

Different arrangements may be made within the scope of the invention. For example, different gearing mechanisms may be used, and different materials employed. In this respect it is, for example, envisaged that the cutting disc 18 could readily be driven from a gear profile on the bowl rim, or on the outside of a central support column (if present) of the bowl.

Whilst the described embodiment uses a toothed drive belt 32 to transmit the rotation of the central shaft to the slicing disc 18, an alternative design using gears instead of the belt is envisaged. The choice of drive mechanism used depends at least in part on the drive ratio desired.

The cutting edge of the disc 18 may be sharpened and/or serrated or otherwise treated to achieve a desired food processing performance. In some embodiments the cutting edge is multi-faceted. In other embodiments, a sinuous shaping is applied to the cutting edge of disc 18, so that convex and concave cutting surfaces are alternately presented to the foodstuffs.
Instead of using a truly discoidal cutting member such as 18, the cutter plate 10 may employ, for example, an octagonal or a decagonal cutting member or, indeed, a cutting member with any number of sides that is convenient and effective to use in practice.

The cutting member 18 may or may not be formed of the same material as the support member 16. For instance, one may be metallic and the other of plastics material.

In some embodiments of the invention, depending on materials used and weight distributions, it may be beneficial to compensate, at least in part, for any out-of-balance forces generated by the cutter plate 18 and its movement. If such compensation is provided, it can usefully take the form of a fixed blade member suspended beneath and parallel to the support disc 16 and utilised to redistribute, within the bowl, cut foodstuffs that may have accumulated in a particular area of the bowl; thus utilising the principles described in our co-pending UK patent application No. GB 1118186.4 and International application No. PCT/GB2012/052485.

Referring to Figure 5, a cutter plate 10 in accordance with one example of this invention is typically used with a food processor which includes a bowl 40 in which foodstuffs can be processed. The bowl 40 is provided with a lid 41 having an aperture 42 therein, and carries a feed-tube 43, through which foodstuffs to be processed can be introduced into the bowl, The feed-tube 43 is located over said aperture 42, so that foodstuffs can be introduced into the bowl through the tube 43.
The bowl 40 is supported for operation upon an upper surface 51 of a base 50 which contains an electric motor (not shown) and presents a drive outlet 52, coupled to the motor, on its bowl-supporting surface 51. The speed of the motor and its mode of operation (e.g. continuous or pulsed) is, in this example, controllable by means of a rotatable knob 53 on one of the upright surfaces 54 of the base 50 but it will be appreciated that any convenient form of control can be used.

The base of the bowl 40 is centrally apertured, as shown at 44, allowing access to the drive outlet 52 on the base 50, and is further, in known manner, integrally formed with an internal chimney 55 centered on the aperture 54. A drive shaft 60 which, in use, engages and is driven by the drive outlet 52, extends through the chimney 55 and thus centrally of the bowl 40 to a location, close to the underside of the lid 41, where it supports the cutter plate 10 (not shown in Figure 5), which is designed and configured to process foodstuff urged against it by means of a pusher 70 inserted into the feed-tube 43.
Claims:

1. In or for a food processor, a cutter plate (10) comprising a discoidal support member (16) adapted to be driven in rotation about its natural axis (22) and bearing a cutting member (18) mounted for rotation thereon about a second axis (20), disposed substantially parallel to but radially spaced from said natural axis (22); said cutter plate (10) further comprising drive means (24, 28, 32) adapted to drive said cutting member (18) in rotation about said second axis (20) when the support member (16) is driven in rotation about its natural axis (22).

2. A cutter plate according to claim 1, wherein said cutting member (18) is discoidal and wherein said second axis (20) is the natural axis of the cutting member.

3. A cutter plate according to claim 1 or claim 2, wherein said cutting member (18) has a blade surface which repeatedly slices through foodstuffs urged on to said cutter plate (10) as it moves bodily about the natural axis (22) of said support member (16) and in rotation about said second axis (20).

4. A cutter plate according to claim 3, wherein said blade surface is serrated to enhance said slicing.

5. A cutter plate according to claim 3, wherein said blade surface is facetted or sinuous.
6. A cutter plate according to any preceding claim, wherein said drive means incorporates a drive belt (32) extending from a driving pulley (28) mounted at a central region of said support member (16) to a driven pulley (24) mounted at a central region of said cutting member (18).

7. A cutter plate according to any preceding claim, wherein the support member (16) is adapted to be driven from a drive shaft (60) of a food processor; said drive shaft extending along the natural axis (22) of said support member (16).

8. A cutter plate according to any preceding claim, wherein an aperture is formed in said support member (16) providing part at least of a gap (38) through which foodstuffs sliced by said cutting member (18) can fall into a food processing bowl (40).

9. A cutter plate according to claim 8, wherein an underside of said support member (16) bears a downwardly dependent distribution means adapted to redistribute foodstuffs accumulating in the bowl (40) and approaching said underside of the support member (16).

10. A food processor including a cutter plate (10) according to any preceding claim.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47J43/07 A47J43/046 B26D1/16 B26D5/08
ADD.

According to International Patent Classification (IPC) or both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47J B26D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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Further documents are listed in the continuation of Box C. See patent family annex.

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