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(54) **Title:** FOOD PROCESSOR ARRANGEMENTS

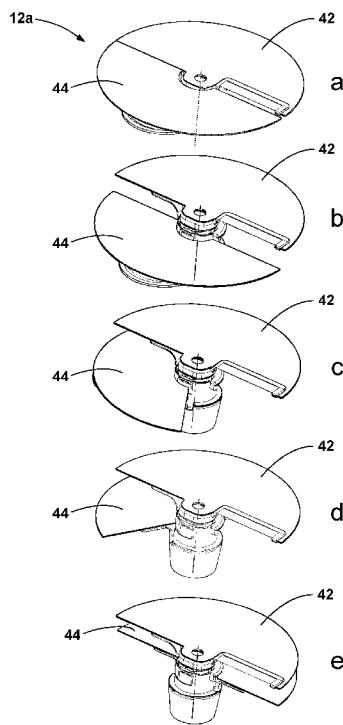


Fig 7

(57) **Abstract:** This invention relates to food processor arrangements, of the kind in which the food processor is fitted with a cutter plate located just beneath the lid of its bowl and close to a feed-tube entry through the lid, and the cutter plate, which is in the form of a disc carrying a blade, is rotated rapidly by means of an electric motor. In order to provide such food processors with the adaptability to chop or slice foodstuffs into differently sized pieces whilst mitigating the storage requirements for multiple cutter plates with different blade configurations, the invention provides an arrangement (10) in which individual cutter plates (12a) are made in sections (42, 44) which can be opened out to form complete cutter plates and re-positioned and overlain for compact storage. In preferred embodiments, each cutter plate (12a) comprises two generally semi-circular sections (42, 44) with co-operating central portions (48, 62) allowing the two sections to form a complete cutter plate (12a) or to be axially moved and rotated relative to one another so that one section (44) overlies the other (42). In some particularly preferred embodiments of the invention, the central portions (48, 62) of the two sections (42, 44) of the cutter plate (12a) are provided with co-operative adjustable components whereby the height of the blade (40a) above the section which carries it can be adjusted so as to provide several cutting heights with one cutter plate (12a).

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GW, KM, ML, MR, NE, SN, TD, TG).

FOOD PROCESSOR ARRANGEMENTS

This invention relates to food processor arrangements and in particular to cutter plates for use in such arrangements.

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Cutter plates used for chopping or otherwise comminuting foodstuffs in the bowl of an electrically powered food processor are typically located just beneath the lid of a bowl and close to a feed-tube entry through the lid; the cutter plate being rotated rapidly by means of an extension shaft
10 that runs centrally through the bowl and picks up, through the bottom of the bowl, rotary drive from a motor located in a base of the processor.

Usually the bowl sits directly on the base and the cutter comprises a fixed blade, which may be curved or straight and which is pressed out of, or fixedly secured to, a flat, metallic disc. The chopped food typically falls
15 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. In particular, difficulties arise because, in order to allow the
20 user to chop food to differing thicknesses, it is common to provide several cutter plates with differing thicknesses of cut. It is a nuisance for the user to select and fit appropriate plates and moreover the storage of unused plates presents problems.

25 The present invention aims to address, at least in part, the above-described difficulties.

According to the invention there is provided a food processor arrangement comprising a base housing an electrical drive motor and having a bowl-supporting surface presenting a drive outlet driven from the motor; the surface, in use, supporting a lidded bowl having a central axis along which extends a drive shaft conveying the rotational drive from the outlet to a location proximate the underside of the lid of said bowl; the lid of the bowl being apertured to allow insertion therethrough of foodstuffs to be processed in said bowl and said shaft being adapted to support at said location, for rotation by said drive, a cutter disc bearing a cutting blade for impacting said foodstuffs to effect processing thereof; wherein said cutter disc comprises first and second linked sections configured to permit relative movement therebetween; said sections being adapted for selective manipulation by a user to adopt either an operational condition, wherein said sections co-operate to form said cutter disc, or a storage condition, wherein at least a major part of one of said sections overlies the other.

This enables the first and second sections of the cutter disc to be substantially juxtaposed for storage, thereby significantly reducing the storage footprint of the plates, or secured in alignment to create a complete cutter disc.

In some preferred embodiments of the invention, one of said sections is formed with a boss adapted to be driven by said shaft, and the other of said sections supports a tubular component adapted to fit slidably over said boss.

Further preferably, said tubular component is capable of both linear sliding movement along said axis and limited rotational movement about said axis, relative to said boss.

- 5 In some preferred embodiments of the invention, the said section supporting said tubular component further supports an adjuster disc, mounted for rotation on said section about an axis offset from said central axis; said adjuster disc having engagement means co-operative with associated means borne by said boss to control the relative locations of
10 said sections.

Preferably said engagement means and said associated means are adapted to latch said sections together to form said cutter disc for operation, and to delatch said sections and control said linear sliding movement and said
15 limited rotational movement for placement of said sections into the storage condition.

In some preferred embodiments, the engagement means comprises a radially extending flange around the circumference of said adjuster disc and said associated means includes an arcuate slot configured to receive
20 said flange.

In still further preferred embodiments, a cut-out formed in the flange of said engagement means is alignable with said arcuate slot to permit
25 delatching of said sections and said associated means further comprises a relatively broad axially extending slot permitting said linear axial relative movement to occur.

It is further preferred that said associated means still further comprises a circumferentially extending groove permitting said relative rotational movements to occur, whereby the sections can be moved so that one underlies the other.

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It is further preferred in some embodiments of the invention to support said flange of said adjuster disc on a peripherally extending wall upstanding from said adjuster disc, wherein said wall is of variable height.

10 Preferably, the variation in height of said wall conforms to a progressive incline from a minimum to a maximum height, whereby the rotation of said adjuster disc adjusts the relative axial disposition of said sections in the operative condition, thereby permitting an adjustment of the cutting height of said blade.

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In some embodiments of the invention, the blade is formed integrally with one of said sections. In other embodiments, the blade is demountable from the section. In still other embodiments, that blade is adapted to be driven in an oscillatory manner relative to the section supporting it in
20 order to enhance its cutting action.

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:

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Figure 1 shows, in perspective and exploded diagrammatic form, certain elements of a food processor arrangement suitable for use with the present invention, to illustrate how such elements typically co-operate in practice;

- 5 Figure 2 shows a plan view from above of a cutter disc assembled from two sections, in accordance with one example of the invention;

Figures 3(a) and 3(b) show perspective underside views, taken from opposing directions, of one section of the cutter plate;

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Figure 3(c) shows a perspective underside view of the other section of the cutter plate;

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Figure 4 shows a detailed view of an adjuster disc mounted on the section shown in Figure 3(c);

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Figures 5(a), 5(b) and 5(c) show cross-sectional views through the cutter disc and respectively illustrate, in sequence, movement of one of said sections relative to the other from an operational position through an intermediate position to a storage position;

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Figures 6(a) and 6(b) show cross-sectional views through the cutter disc and illustrate how the adjuster disc of Figure 4 can be used to adjust the cutting height of a blade carried by the cutter disc; and

Figures 7(a) through 7(e) show sequential stages in the relative movements of the two disc sections from the operational condition to the storage condition.

5 Referring now to Figure 1, a food processor arrangement 10 includes a cutter disc 12 which carries one or more blades 40 and which, in use, is mounted for rotation, closely beneath the lid 14 of a bowl 16, about an axis 12b. The lid 14 has an aperture 18 therein, and carries a feed-tube 20, through which foodstuffs to be processed can be introduced into the
10 bowl 16. The feed-tube 20 is located over said aperture 18, so that foodstuffs can be introduced into the bowl through the tube 20.

The bowl 16 is supported for operation upon an upper surface 22 of a base 24 which contains an electric motor (not shown) and presents a drive
15 outlet 26, coupled to the motor, on its bowl-supporting surface 22 and aligned on the axis 12b.

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 28
20 on one of the upright surfaces 30 of the base 24 but it will be appreciated that any convenient form of control can be used. In particular, press-button or touch controls may be used and any directly actuated control provided may, if desired, be supplemented with a remote control facility.

25 The bottom of the bowl 16 is centrally apertured, as shown at 32, allowing access to the drive outlet 26 on the base 24, and is further, in known manner, integrally formed with an internally re-entrant tube 34

centered on the aperture 32. A drive shaft 36 which, in use, engages the drive outlet 26, extends through the tube 34 along the line of axis 12b, and thus centrally of the bowl 16, to a location close to the underside of the lid 14, where it supports the cutter plate 12 and drives it in rotation by way of splines 36a, which co-operate with similar splines formed in a boss disposed centrally of the disc 12. Rotation of the disc 12 as described allows the blade 40 to act upon and thus process foodstuff urged against it by means of a pusher 38 inserted into the feed-tube 20.

10 The blade 40 may adopt any of several configurations, including concave, straight and convex with reference to the direction of rotation. The blade may also be disposed substantially radially of the cutting disc 12, as shown in Figure 1, or it may be angled in either direction. Moreover, in any selected configuration, the blade 40 may be fixed on the disc 12, or it
15 may be replaceable (for example to adapt the disc 12 to differing cutting heights) and/or it may be capable of a reciprocating motion, relative to the disc 12, to enhance its cutting performance, for example as described and claimed in our co-pending UK patent application No. GB 1203321.3 (publication No. GB 2499659 A) and/or in its international counterpart
20 application (publication No. WO 2013/128164). In any event, the intention is to have the blade act upon the food stuffs so as to impart a slicing action, the nature and efficiency of which is governed, among other things, by the angle at which the blade attacks the foodstuff and the diameter at which the foodstuff encounters the blade. The disc 12 is
25 apertured, adjacent the blade 40, so that sliced foodstuffs can fall through the aperture and into the bowl 16.

Typical existing cutter discs, however, tend to have a significant storage footprint, and this can cause difficulties, especially when a user needs to house several discs with differing cutter characteristics to provide a wide range of processing capabilities.

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One aspect of the present invention addresses part at least of this difficulty by providing cutter discs which can be manipulated by the user into forms exhibiting a significantly smaller footprint size for storage. Moreover, in preferred examples of the invention, such as the one to be described below, the cutting height of the discs is made variable. Further preferred examples of the invention utilise a mechanism for adjusting the cutting height of the disc that interacts with, and shares some components with, the mechanism used to permit manipulation of the disc into storage form as mentioned above.

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The example of the invention now to be described in detail with reference to Figures 2 et seq. describes one of many possible alternative constructional arrangements, and is provided merely to explain the principles of the invention, without limiting its implementation in any way.

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Referring to Figures 2, 3(a), 3(b) and 3(c), the embodiment of the invention in this example utilises a cutter disc 12a formed of two half sections 42 and 44. The disc section 42 is shown in Figures 3(a) and 3(b), and is referred to for convenience hereinafter as the “fixed half”, since it incorporates a central portion 46 that supports a splined boss 48 (Figure 3(a)), used to couple the disc 12a to the splined drive shaft 36 (referred to

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previously) of the food processor 10. As shown in Figure 2, the fixed half 42 of the disc 12a also supports a cutting blade 40a which may be stamped out of the disc, and thus fixed, but which may alternatively be replaceable and/or capable of oscillatory movement relative to the disc 12a, as previously described. The blade in this instance is supported in a carrier frame or so-called cartridge 50 which is made of a food-grade plastics material and which slides tightly into, or snap-fits into, a suitably shaped cut-out 42a formed in one of the radial faces of the fixed half-disc 42. Bearing in mind its intended usage and location, moreover, the cartridge 50 is preferably fabricated to resist the ingress of foodstuffs and in any event is designed without food traps, so as to be easy to clean.

The disc section 44, which will hereinafter be referred to as the “moveable half”, is shown in more detail in Figure 3(c), and is designed so that, in its operational position, it is secured to and co-operates with the fixed half 42 to form the fully-sized processor disc 12a. The mechanism for implementing the relative axial and rotational movement between the disc halves 42 and 44 utilised to move them into their overlying position for storage will subsequently be described in detail. In principle, however, the movement is achieved by unlocking the half discs from their operational position, sliding the moveable half 44 axially along the boss 48 of the fixed half 42 and then rotating the moveable half 44 around the boss 48 so that the two half sections 42 and 44 are juxtaposed with one another.

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Referring again to Figures 3(a) and 3(b), the boss 48, which is attached to or formed integrally with the region 46 of the fixed half 42 of the cutter

disc 12a, is formed with a number of features important to the operation of this embodiment of the invention. Firstly, it is formed with an arcuate cut out 56 communicating with an adjoining, axially and circumferentially extending, and therefore C-shaped, slot 58 cut out of the main circular housing part of the boss 48. The cut-out 56 bites more deeply into the central boss 48 than does the C-shaped slot 58, for a reason that will become clear later. Moreover, the lower part of the slot 58 is extended at one side into a groove 60 running circumferentially around the main circular housing part of the boss 48 and extending for about 180 degrees there-around, in order to accommodate the rotation of one half disc 42 relative to the other 44, thereby enabling the disc halves to be moved into and out of their juxtaposed (storage) position.

Referring now to Figures 3(c) and 4, the moveable half 44 of the cutter disc 12a is formed with or supports a central tube 62 dimensioned to slide easily over the boss 48, and capable of both linear and circular motion along and about the main axis 12b of the cutter disc 12a relative to the boss 48. The moveable half 44 is also provided with an adjuster disc 64 (shown separately in Figure 4) that is user-rotatable, on the disc half 44, about an axis 64a, which is offset from, but parallel to, the axis 12b. The outer periphery of the adjuster disc 64 is formed with a radially-extending flange 66, which is supported on a circumferential wall 64b upstanding from the disc 64. The wall 64b varies in height around the circumference of the disc 64, such that, if it were to be "unwound" from the circumference of disc 64, it would present a gradual ramp, which can be linear or curved; the ramp being used for the aforementioned adjustment of the cutting height of blade 40a, as will be described later.

- There is a circumferentially-extending gap 64c in the wall 64a, the gap being located between the lowest and highest points of the wall 64a, and the flange 66 is formed with an arcuate cut out segment 70, of similar diameter to that of the aforementioned "C" shaped cut out 58 in the boss 48 of the fixed half 42 of the disc 12a; the centre of the segment 70 being located at the transition between the gap 64c and the highest point of the wall 64b, as best shown in Figure 4.
- 10 When the two half sections 42 and 44 of the disc 12a are fitted together, i.e. with the tube 62 surrounding the boss 48, both half sections share the same major axis 12b. When this is the case and the disc halves are assembled to form the cutter disc 12a, the shapes and configurations of the tube 64 and the boss 48 are designed to ensure that both disc halves are fixed in relation to one another, except for relative movement along the major axis 12b, which is permitted when the cut-out segment 70 formed in the flange 66 of the disc 64 is aligned with the C-shaped cut-out 58 in the boss 48.
- 15
- 20 As illustrated in the cross-sectional views of Figures 5(a) and 5(b), manipulation of the adjuster disc 64 about its axis 64a, and thereby of the positioning of the flange 66 or the cut-out 70 therein in the circular cut out 56 in the boss 48, effectively controls the facility for relative movement between the disc halves 42 and 44 along the major axis 12b.
- 25 The aforementioned adjustment of the cutting height of blade 40a is also achieved by manipulation of the adjuster disc 64, as will be described with reference to Figures 6(a) and 6(b). Reverting to Figures 5(a) and

5(b), however, rotation of the adjuster disc 64, to align the cut out segment 70 with the circular cut out 56 in the fixed boss 48, allows the moving half 44 of the cutter disc 12a to move downwards, along the major axis 12b of the disc 12a as a whole, since the flange 66 no longer protrudes into the arcuate cut out 56. The moving half 44 of the disc 12a is able to move only along the major axis 12b because the cut out segment 70 is constrained within the "C" shaped cut out 58 in the fixed boss 48.

When the moving half 44 of the cutter disc 12a, and therefore the cut out segment 70, reaches the bottom of the "C" shaped cut out 58, the cut out segment 70 is able to rotate about the major axis 12b, as it is now able to move in the circumferentially-extending groove 60. Once the cut out segment 70 is in the groove 60, the moving half 44 of the disc 12a is effectively constrained in position along the major axis with regard to the fixed half 42 thereof.

As the groove 60 extends only for 180 degrees around the fixed boss 48, the moving half 42 of the disc 12a can only rotate through 180 degrees about the major axis 12b; in doing so effectively rotating so as to lie directly under the fixed half 42 of the disc 12a, as shown in Figure 5(c).

As mentioned above, and as will now be described in more detail with reference to Figures 6(a) and 6(b), and with further reference to Figure 2, this particular embodiment of the invention permits the relative levels of the two sections of the disc 12a to be variably adjusted between an axially aligned position, shown in Figure 6(a) and defining a minimum setting height for the blade 40a, and an axially non-aligned position (shown in

Figure 6(b)), at which the disc section 42 is stepped below the disc section 42 by an extent defining a maximum cutting height for the blade 40a. As can be seen in Figure 2, at one side of the disc 12a, the radial faces of the half-discs 42 and 44 are aligned, as shown at 52 and indeed, at the minimum blade height setting shown in Figure 5(a), they abut tightly together, thereby presenting a substantially uninterrupted disc surface. On the other side of the disc 12a, however, part at least of the radial surface of the moving half 44 of the disc is designed to fall short of alignment with the corresponding surface of the fixed half 42, so as to create an aperture 54 adjacent the blade 40a, through which (as previously mentioned) foodstuffs cut by the blade 40a can fall into the processing bowl 16. This gap of course varies in height, depending upon the selected adjustment of the relative levels set between the fixed and moveable halves of the disc 12a.

15

It will be appreciated that, provided the flange 66 of the adjuster disc 64 extends into the arcuate cut-out 56, adjustment of the relative levels of the disc halves 42 and 44 in the operative (cutting) mode of the disc 12a is set by the orientation of the disc 64 about its axis 64a; a parameter which determines the height of the ramped wall 64b associated with that part of the flange 66 for the time being located in the arcuate cut-out 56.

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The adjuster disc 64 is formed with a viewing hole 72 which allows the user to see through to markings (not shown) on the parts underneath that indicate the position of the adjuster disc 64 about axis 64a, and therefore the current thickness of the slice to be cut. This function could

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alternatively, or in addition, be achieved with markings or an indicator on the lip 66.

In this exemplary embodiment of the invention, the blade height
5 adjustment mechanism and the blade section folding mechanism are performed by inter-related means, but it will be appreciated that the two mechanisms can be performed independently if preferred, and it will further be appreciated that it is possible to provide cutter discs having one or the other mechanism alone.

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Figures 7(a) through 7(e) show respective stages in the conversion of the disc 12a from its operational position (Figure 7(a)) to its storage position (Figure 7(b)).

Claims:

1. A food processor arrangement (10) comprising a base (24) housing an electrical drive motor and having a bowl-supporting surface (22) presenting a drive outlet (26) driven from the motor; the surface (22), in use, supporting a lidded bowl (16) having a central axis (12b) along which extends a drive shaft (36) conveying the rotational drive from the outlet (26) to a location proximate the underside of the lid (14) of said bowl; the lid (14) of the bowl (16) being apertured to allow insertion therethrough of foodstuffs to be processed in said bowl and said shaft (36) being adapted to support at said location, for rotation by said drive, a cutter disc (12a) bearing a cutting blade (40a) for impacting said foodstuffs to effect processing thereof; wherein said cutter disc (12a) comprises first and second linked sections (42, 44) configured to permit relative movement therebetween; said sections being adapted for selective manipulation by a user to adopt either an operational condition, wherein said sections (42, 44) co-operate to form said cutter disc (12a), or a storage condition, wherein at least a major part of one of said sections (42, 44) overlies the other.

20

2. An arrangement according to claim 1, wherein one of said sections (42) is formed with a boss (48) adapted to be driven by said shaft (36), and the other of said sections (44) supports a tubular component (62) adapted to fit slidably over said boss (48).

25

3. An arrangement according to claim 2, wherein said tubular component (62) is capable of both linear sliding movement along said

axis (12b) and limited rotational movement about said axis (12b), relative to said boss (48).

4. An arrangement according to claim 2 or claim 3, wherein the said section (44) supporting said tubular component (62) further supports an adjuster disc (64), mounted for rotation on said section about an axis (64a) offset from said central axis (12b); said adjuster disc (64) having engagement means co-operative with associated means borne by said boss (48) to control the relative locations of said sections (42, 44).

10

5. An arrangement according to claim 4, wherein said engagement means and said associated means are adapted to latch said sections (42, 44) together to form said cutter disc (12a) for operation, and to delatch said sections (42, 44) and control said linear sliding movement and said limited rotational movement for placement of said sections (42, 44) into the storage condition.

6. An arrangement according to claim 4 or claim 5, wherein the engagement means comprises a radially extending flange (66) around the circumference of said adjuster disc (64) and said associated means includes an arcuate cut-out (56) configured to receive said flange (66).

7. An arrangement according to claim 6, wherein a cut-out (70) formed in the flange (66) of said engagement means is alignable with said arcuate cut-out (56) to permit delatching of said sections (42, 44); and wherein said associated means further comprises a relatively broad axially

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extending slot (58) permitting said linear axial relative movement to occur.

8. An arrangement according to claim 6 or claim 7, wherein said
5 engagement means further comprises a peripherally extending wall (64b)
upstanding from said adjuster disc (64) and supporting said flange (66);
and wherein said wall (64b) is of variable height.

9. An arrangement according to claim 8, wherein the variation in
10 height of said wall (64b) conforms to a progressive incline from a
minimum to a maximum height, whereby the rotation of said adjuster disc
(64) adjusts the relative axial disposition of said sections (42, 44) in the
operative condition, thereby permitting an adjustment of the cutting
height of said blade (40a).

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10. An arrangement according to any of claims 4 to 9, wherein said
associated means further comprises a circumferentially extending groove
(60) permitting said relative rotational movements to occur, whereby the
sections (42, 44) can be moved so that one underlies the other.

20

11. An arrangement according to any preceding claim, wherein the
cutting blade (40a) is formed integrally with one of said sections (42 or
44).

25 12. An arrangement according to any of claims 1 to 10, wherein the
blade (40a) is demountably supported in one of said sections (42 or 44).

13. An arrangement according to any of claims 1 to 10, wherein said cutting blade (40a) is supported by one of said sections (42 or 44) and is adapted to be driven in an oscillatory manner relative to the section supporting it.

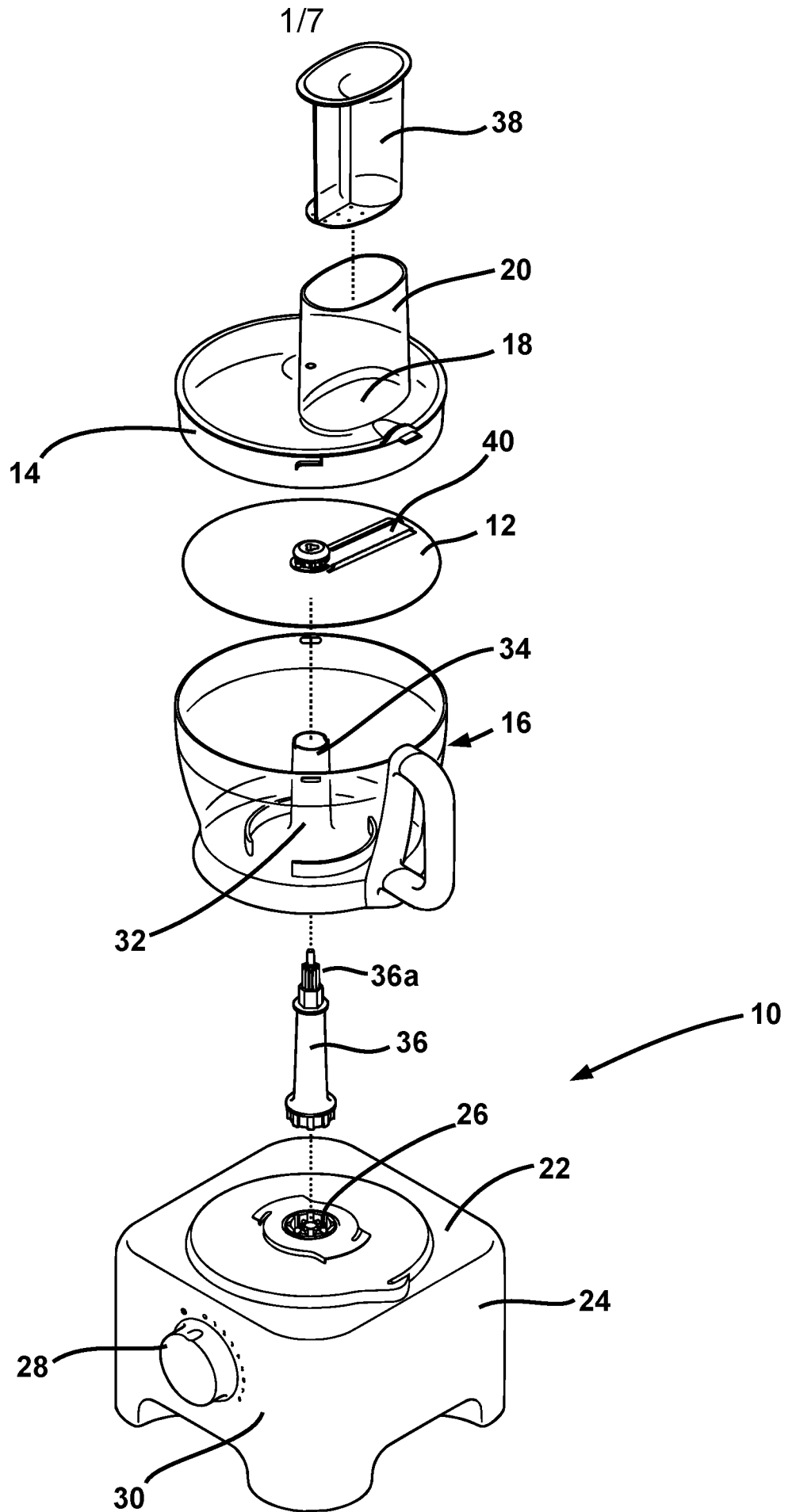


Fig 1

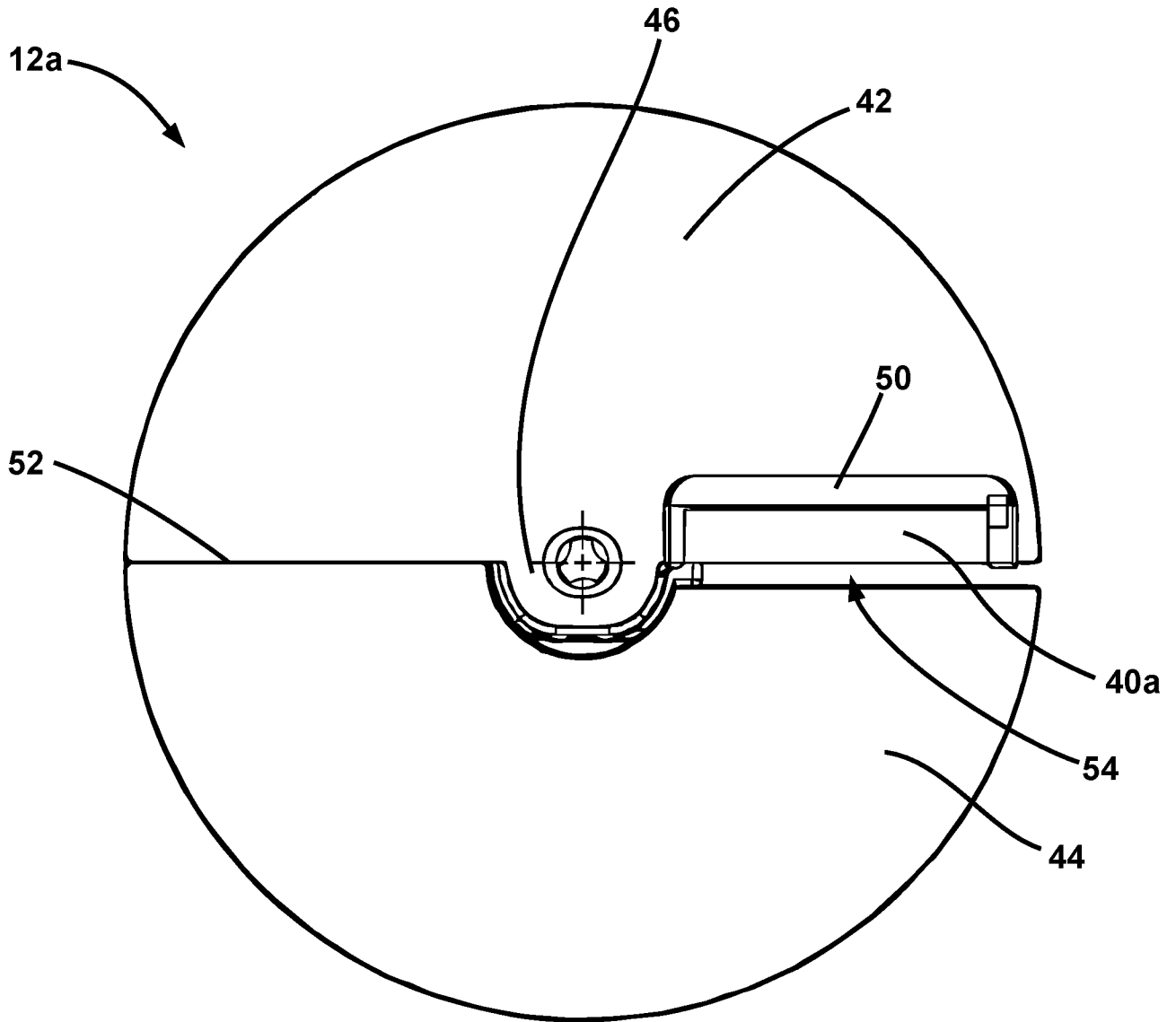


Fig 2

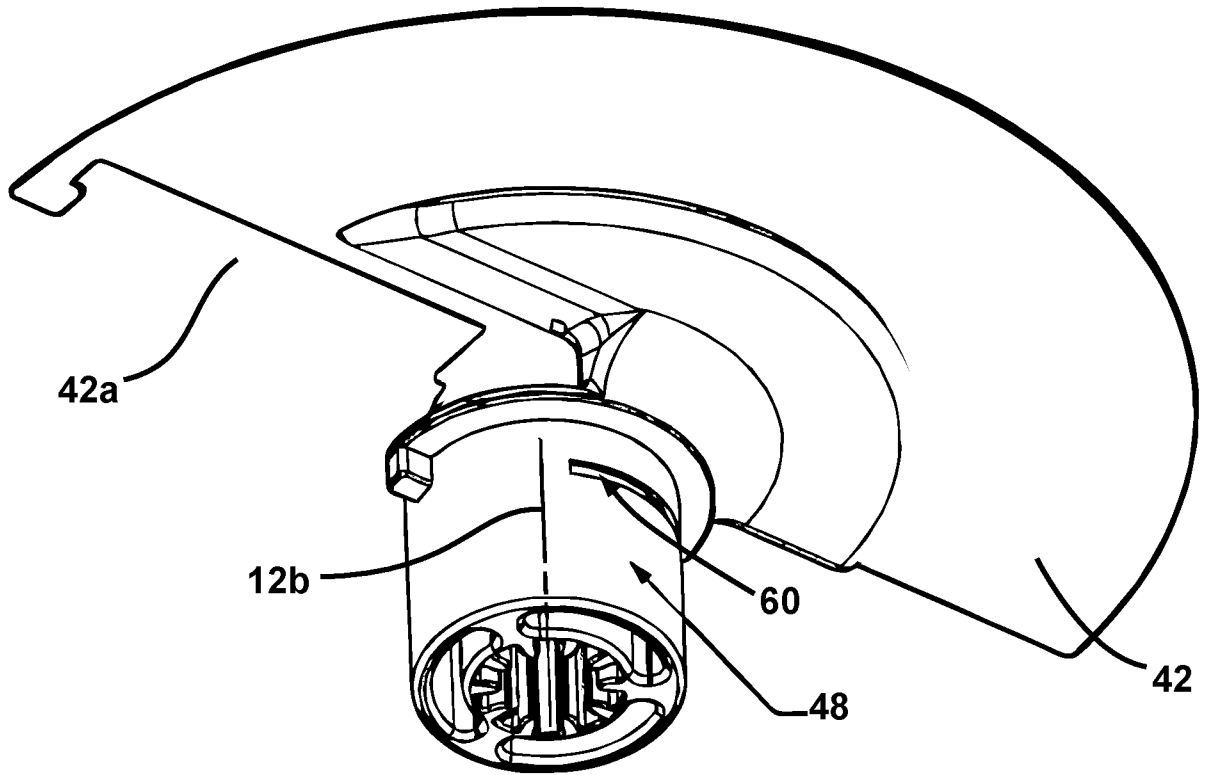


Fig 3(a)

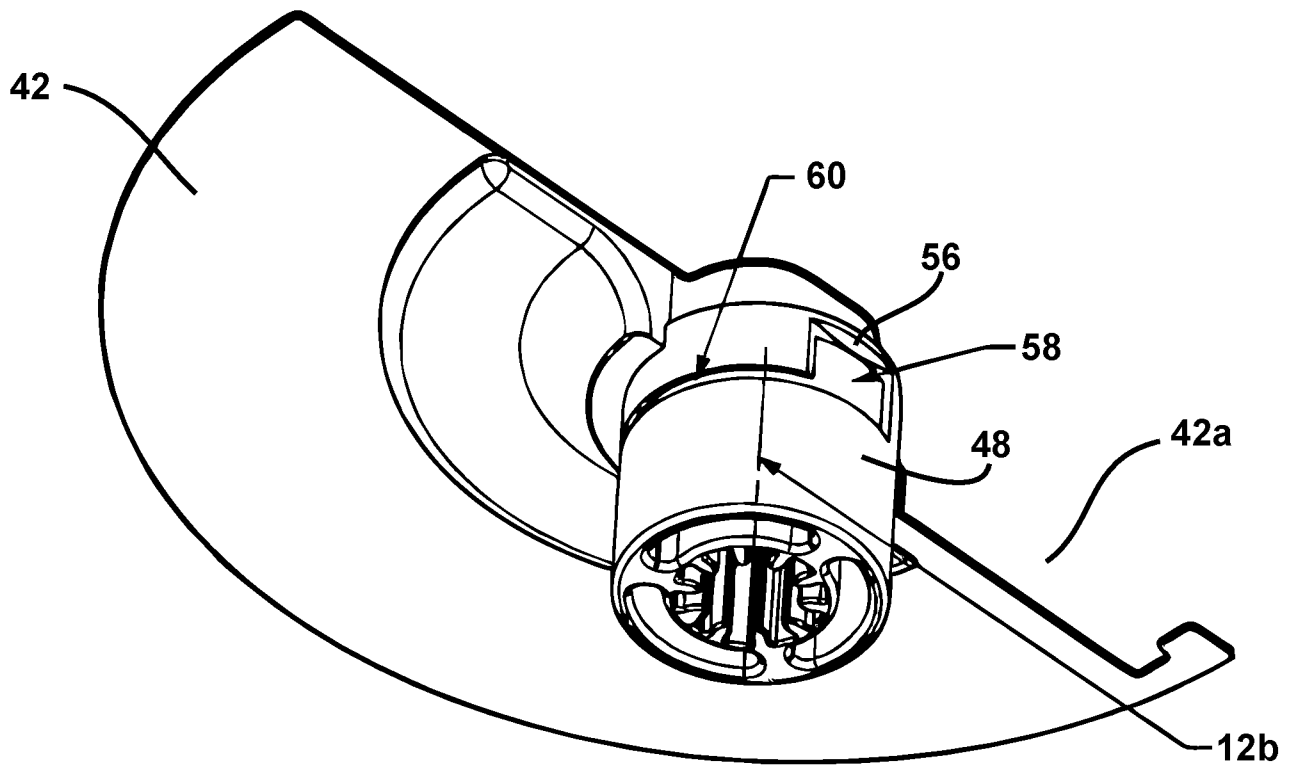


Fig 3(b)

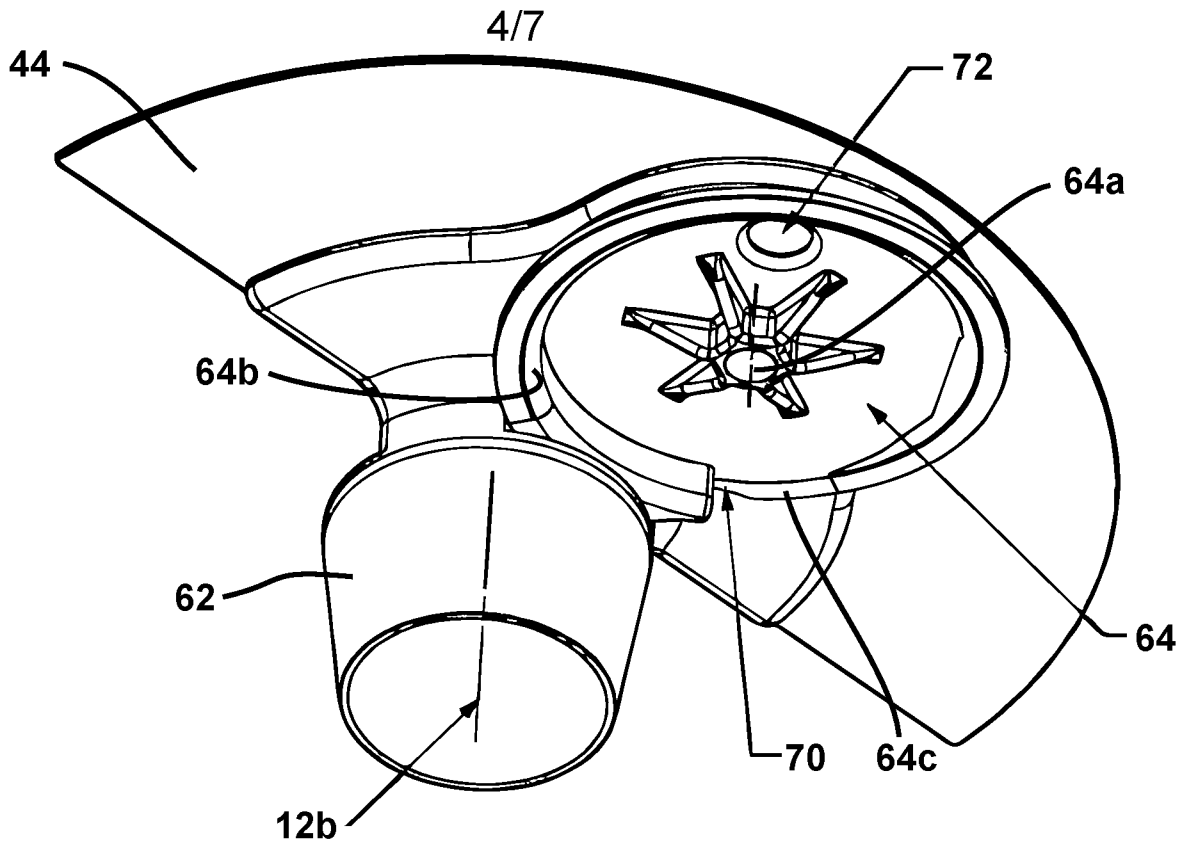


Fig 3(c)

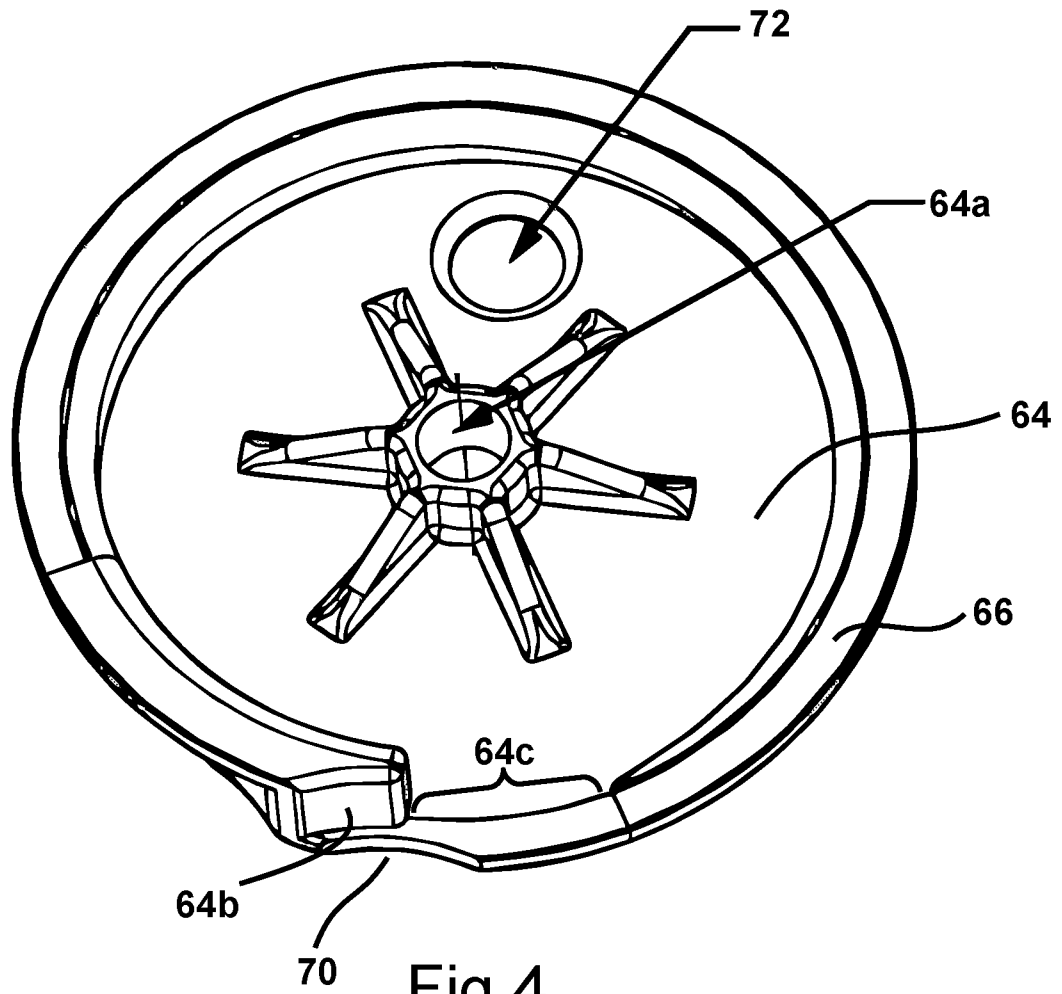


Fig 4

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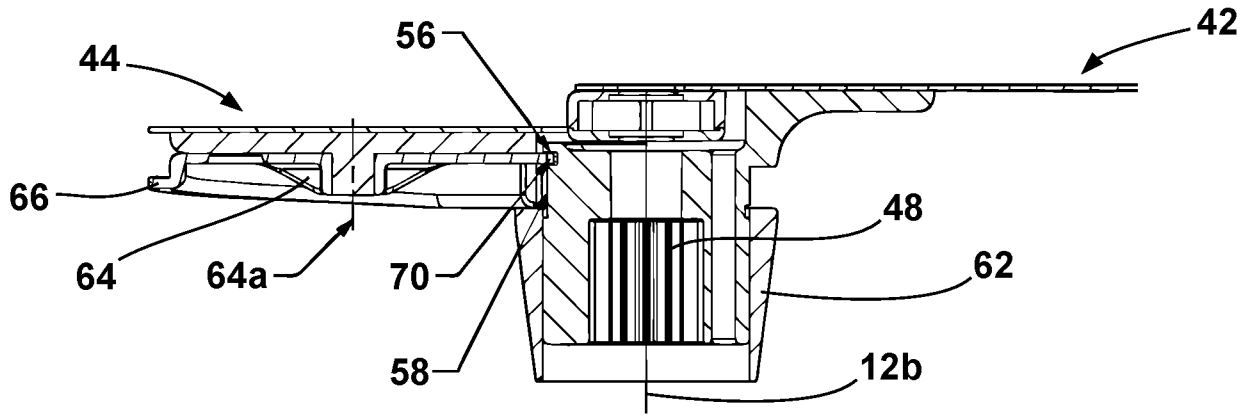


Fig 5(a)

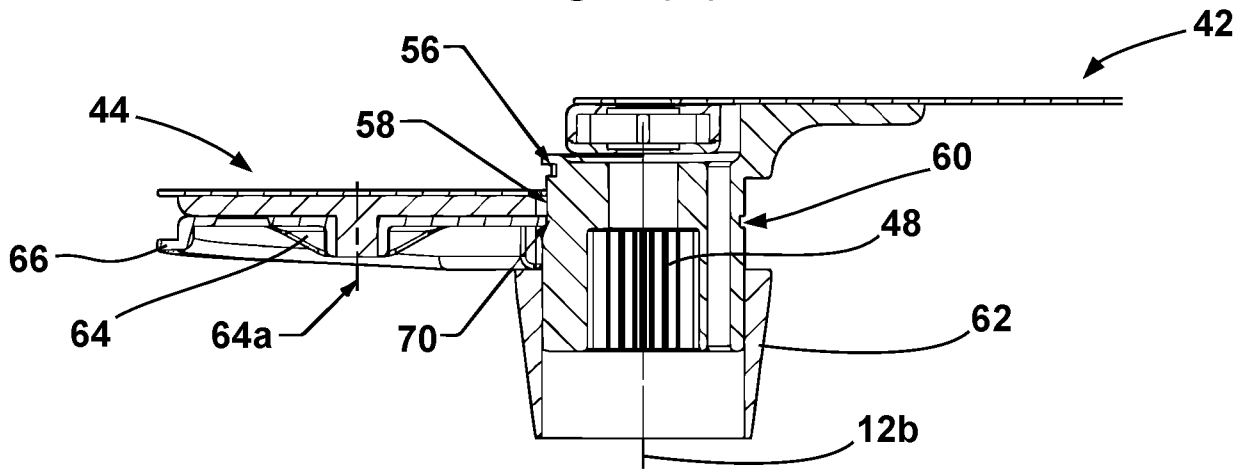


Fig 5(b)

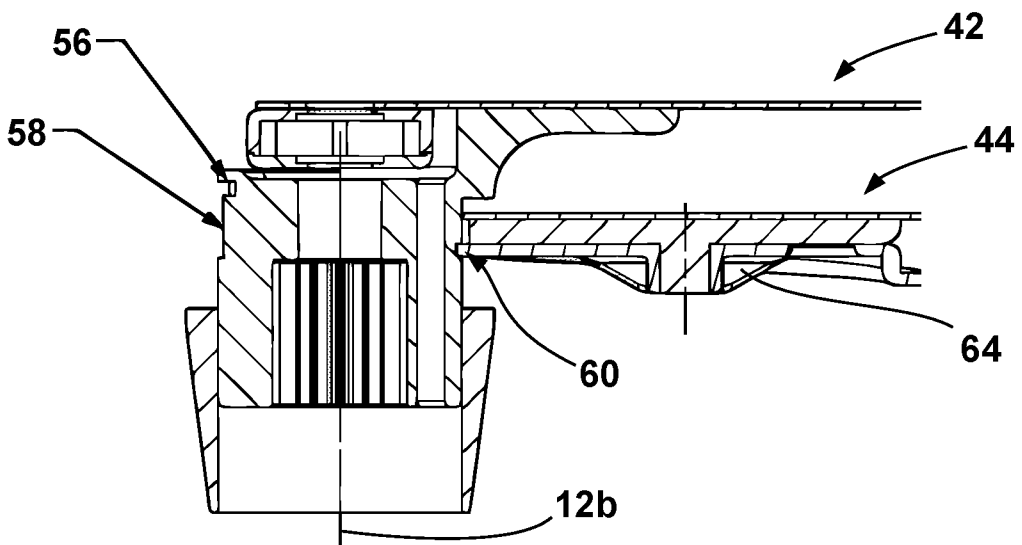


Fig 5(c)

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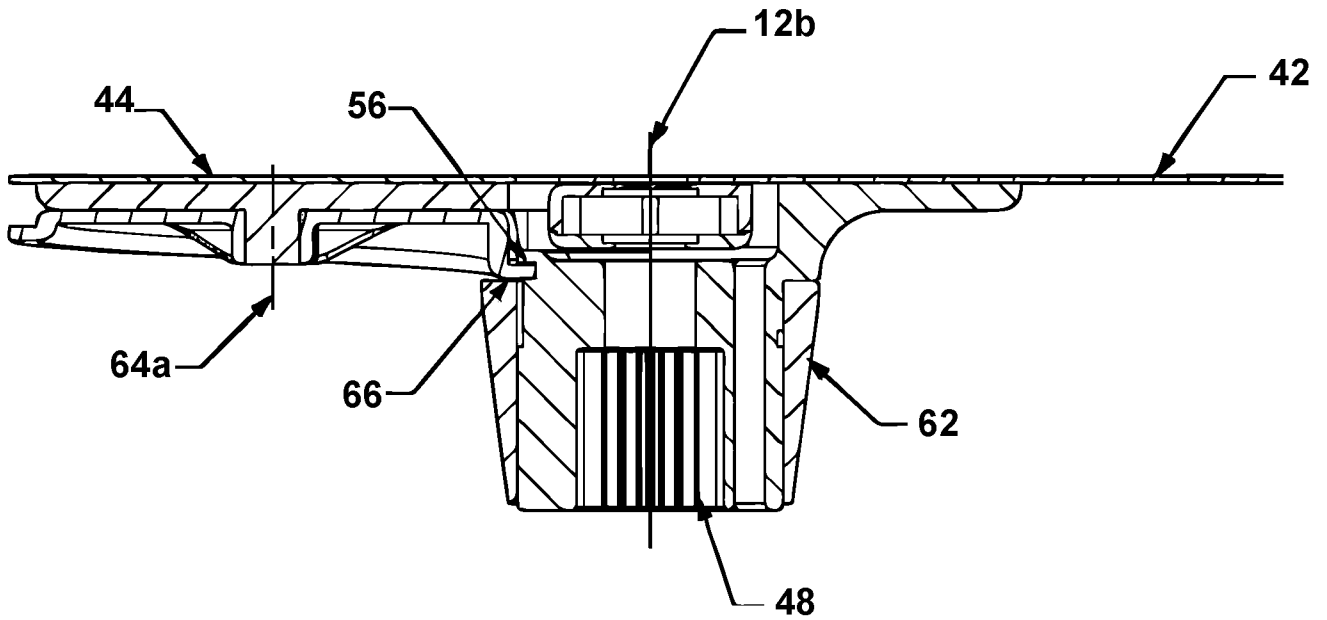


Fig 6(a)

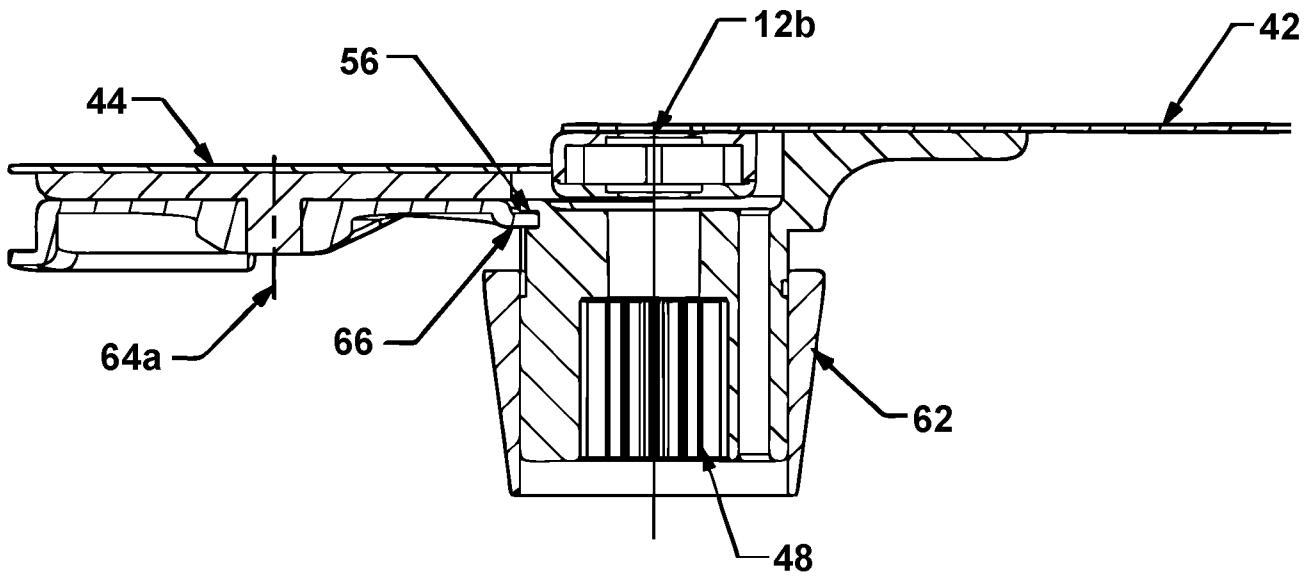


Fig 6(b)

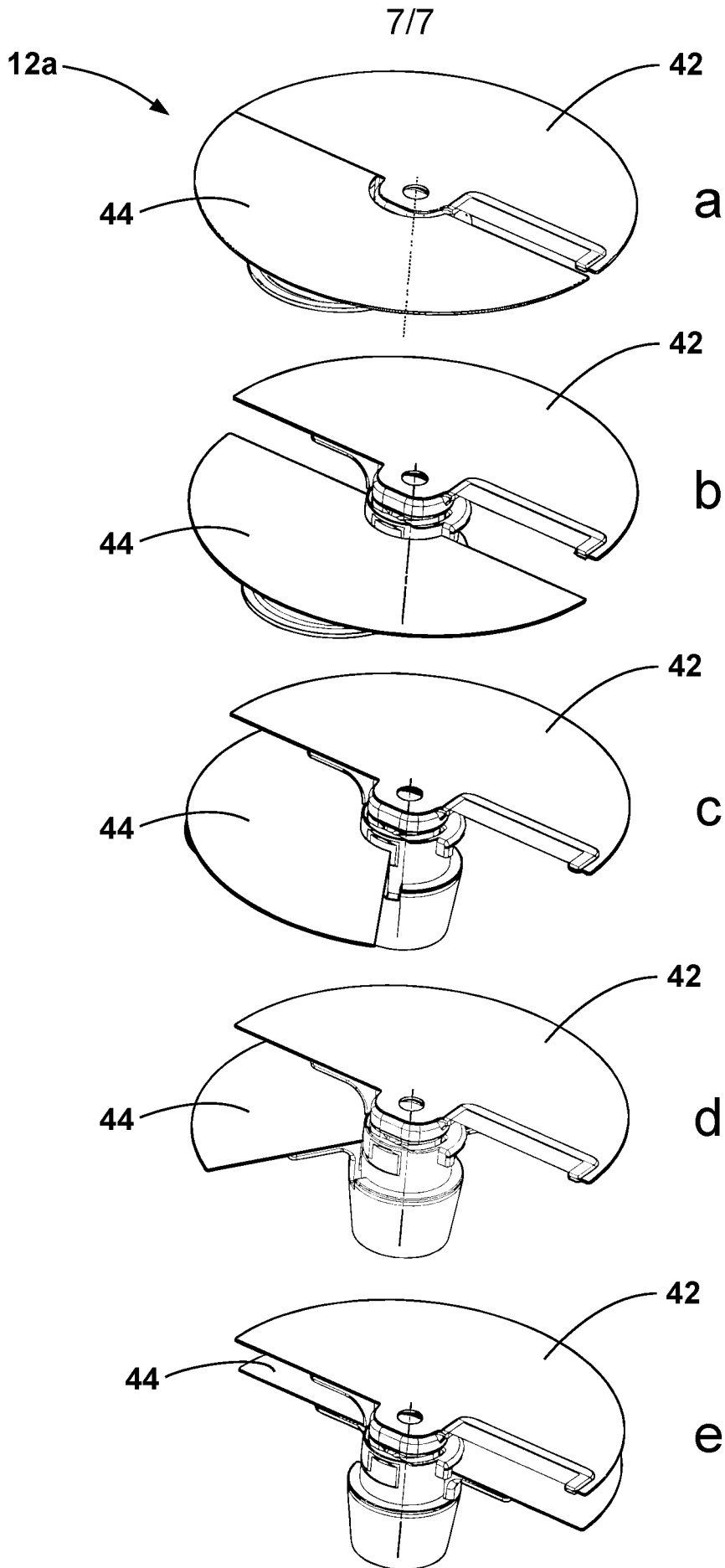


Fig 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2014/050355

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47J43/07
ADD.

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

B. FIELDS SEARCHED

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

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2012/113106 A1 (WHIRLPOOL CO [US]; GUSHWA DAVID J [US]; JIE QUZHI [CN]; HIN YUNGLONG) 30 August 2012 (2012-08-30) paragraphs [0032], [0035], [0036], [0038] - [0040]; figures 2-4 -----	1,9,12
A	FR 2 962 023 A1 (SEB SA [FR]) 6 January 2012 (2012-01-06) paragraphs [0028], [0029], [0032], [0033], [0042]; figures 2-4 -----	1,9

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search 4 April 2014	Date of mailing of the international search report 14/04/2014
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Novelli, Bruno
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2014/050355

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