Dec. 3, 1963 S. J. POPEIL 3,112,781

VARIABLE CUT DICER-SLICER

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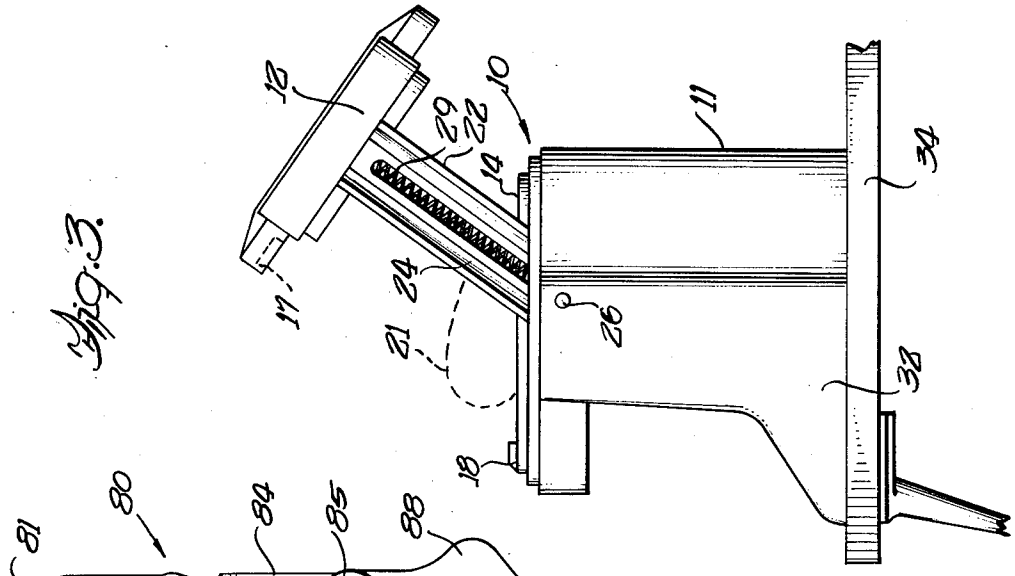


Fig. 3.

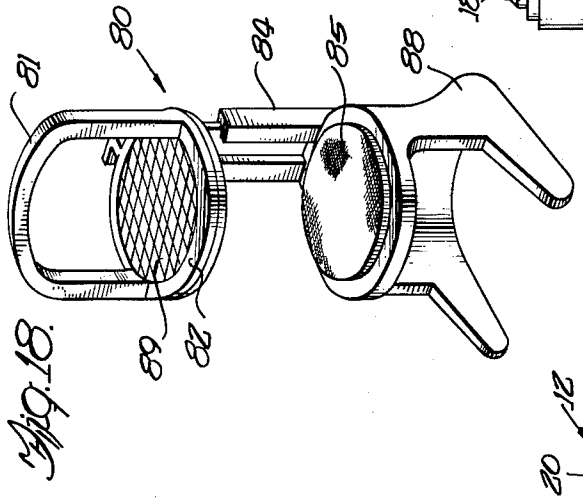


Fig. 18.

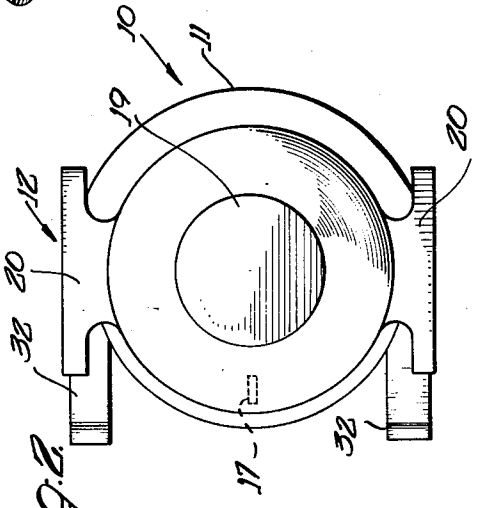


Fig. 2.

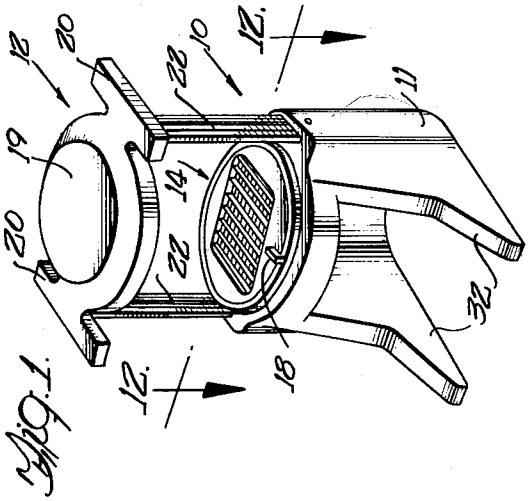


Fig. 1.

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VARIABLE CUT DICER-SLICER

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Fig. 4.

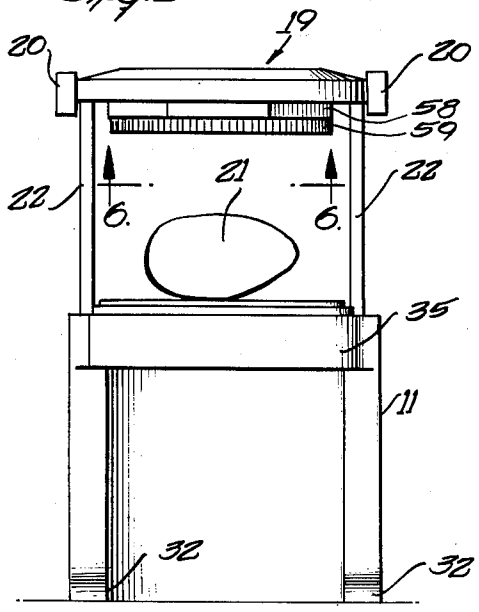


Fig. 5.

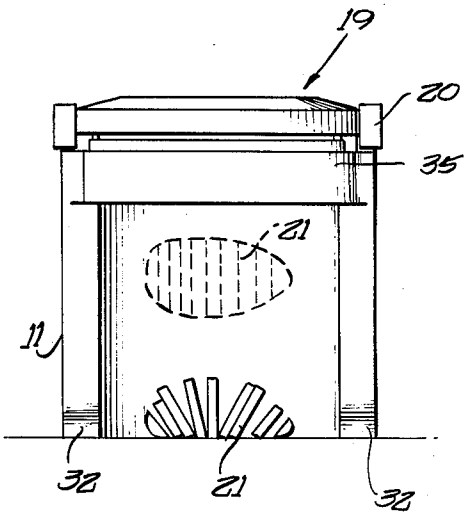
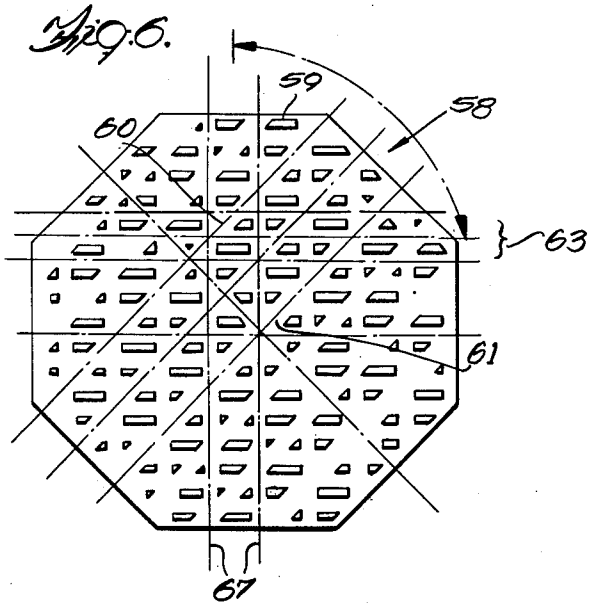


Fig. 6.



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VARIABLE CUT DICER-SLICER

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Fig. 7.

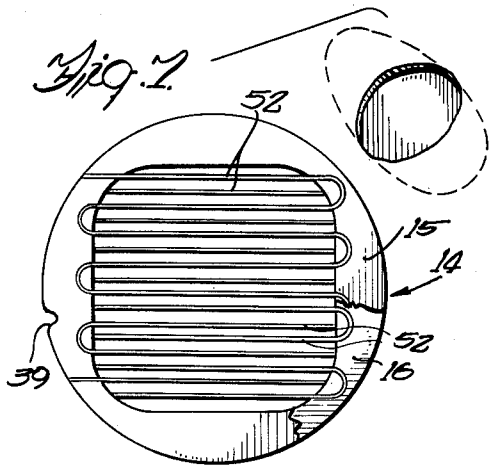


Fig. 8.

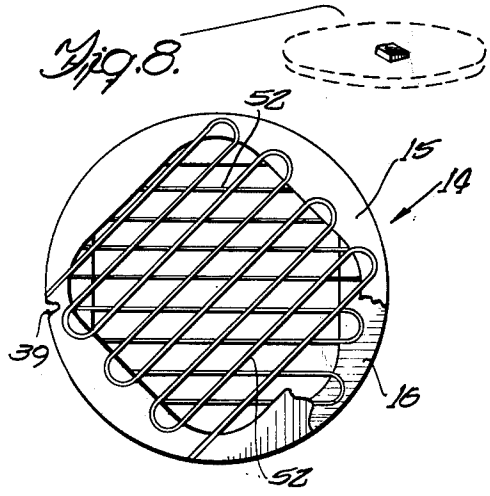


Fig. 9.

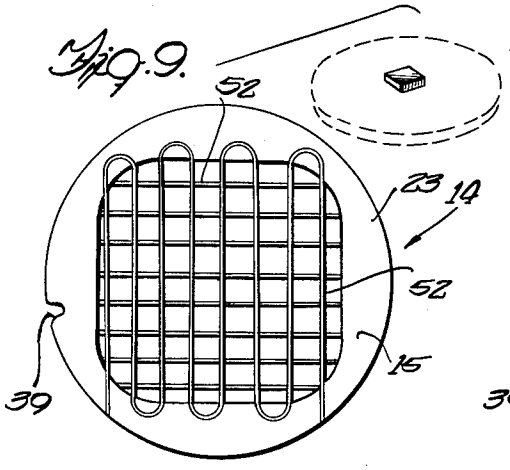


Fig. 10.

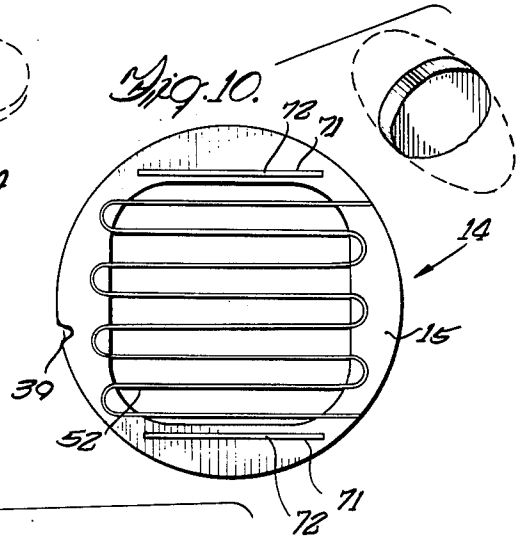
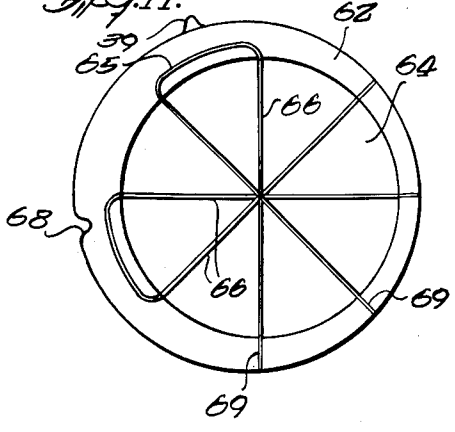
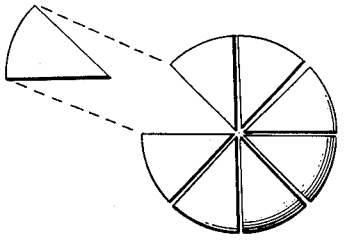


Fig. 11.





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Fig. 12.

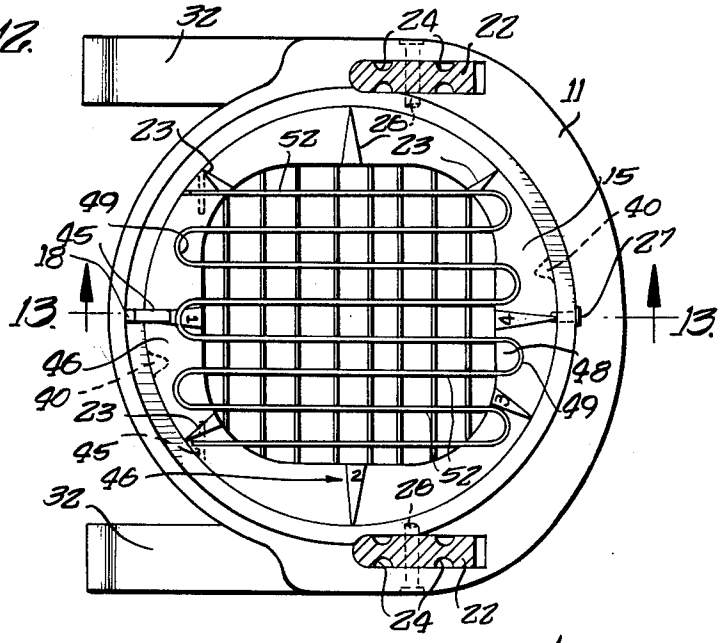


Fig. 13.

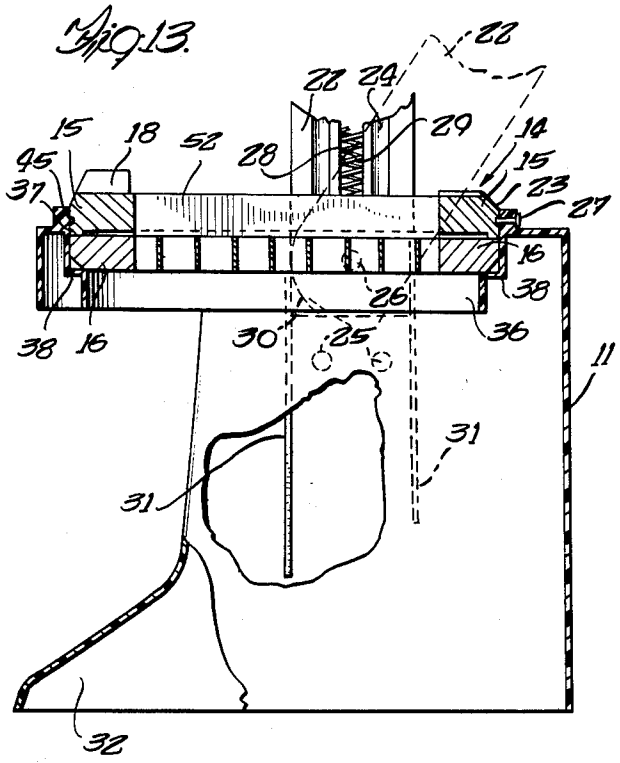


Fig. 14.

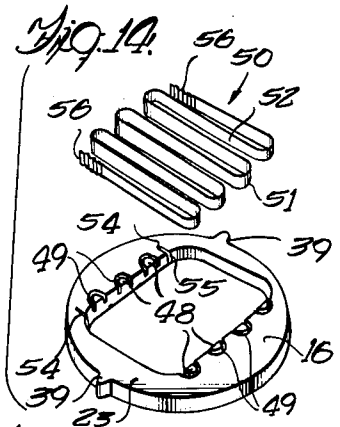
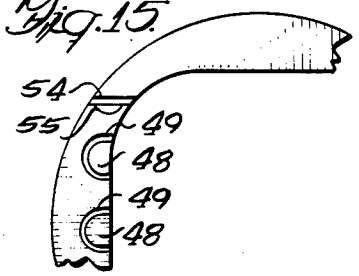


Fig. 15.



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Fig. 16.

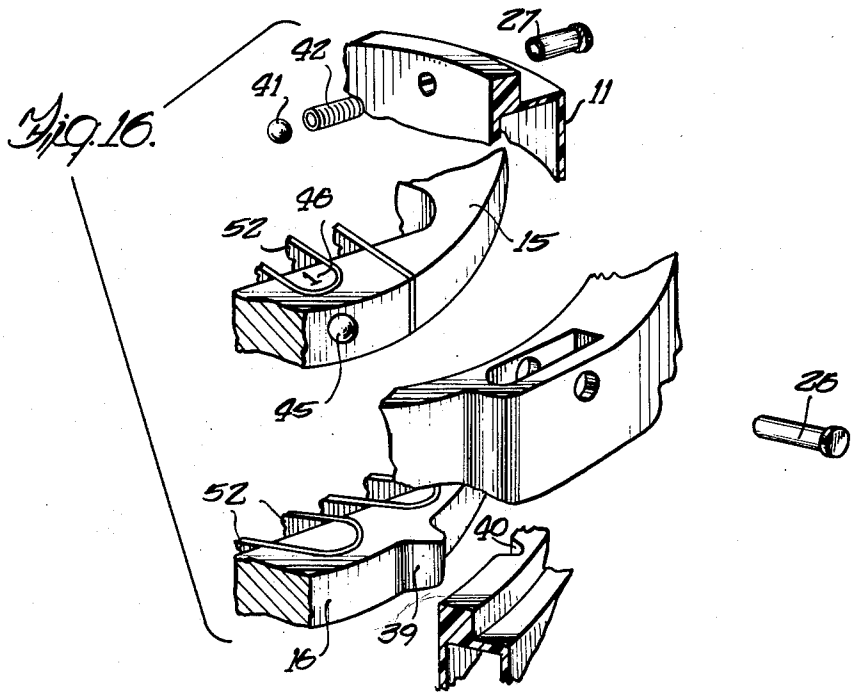
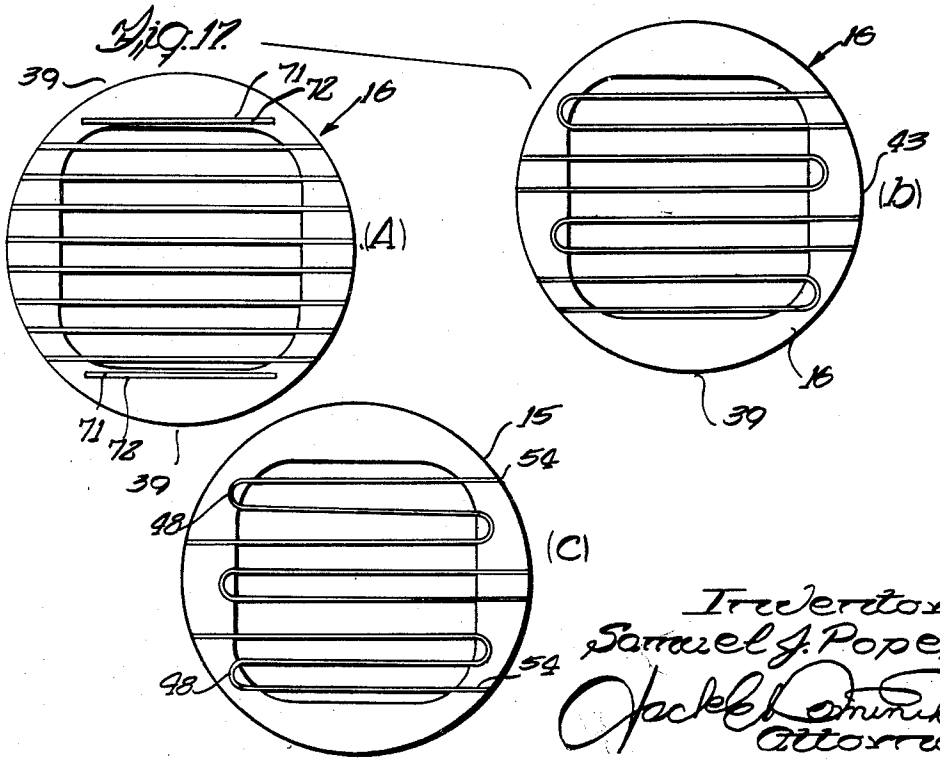


Fig. 17.



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VARIABLE CUT DICER-SLICER

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Fig. 19.

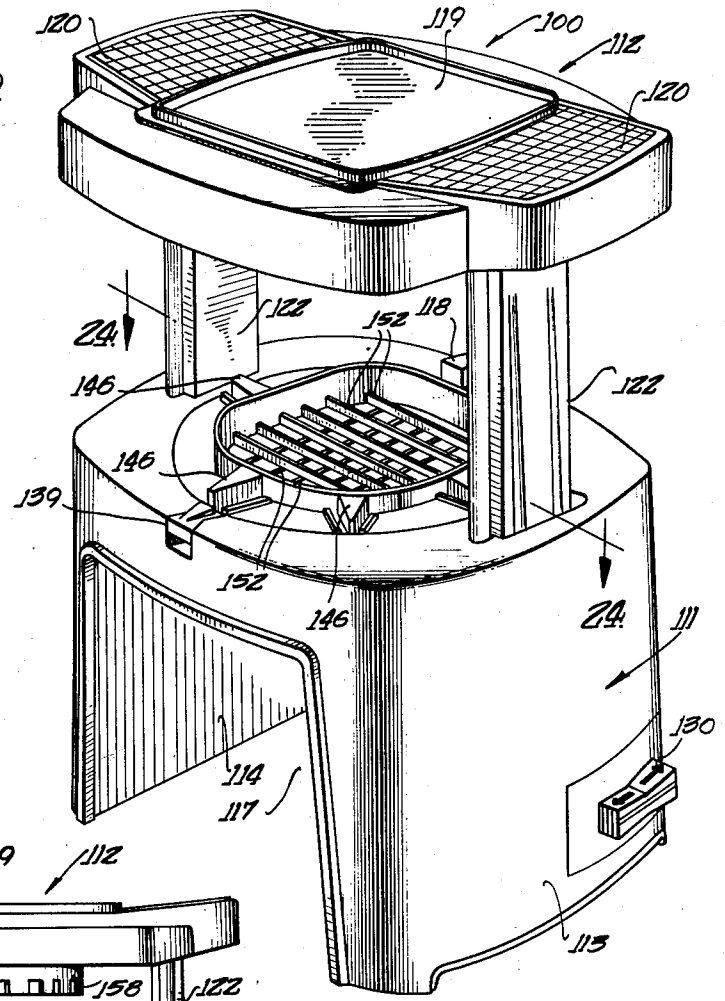


Fig. 20.

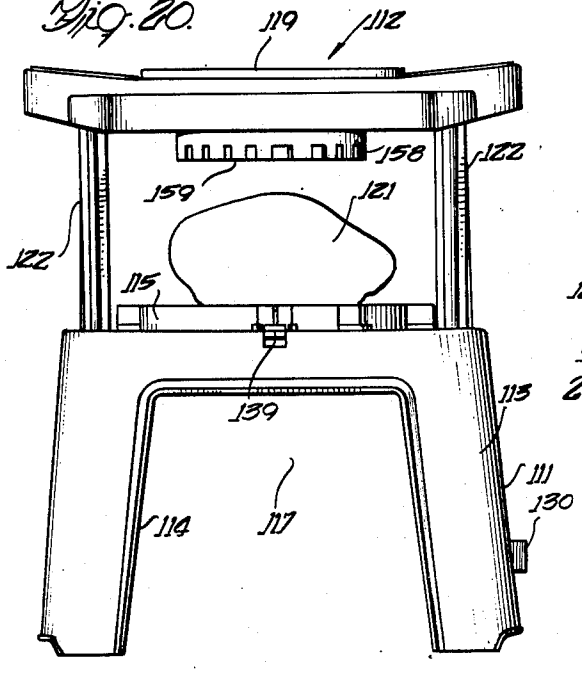
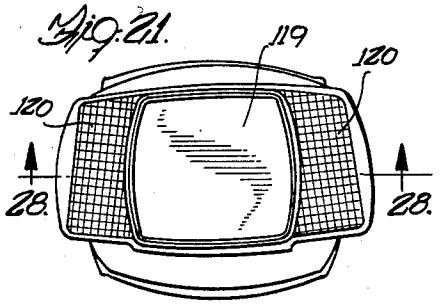


Fig. 21.



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VARIABLE CUT DICER-SLICER

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Fig. 22.

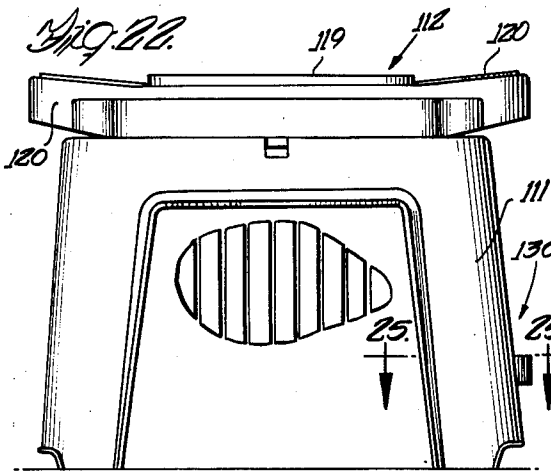


Fig. 23.

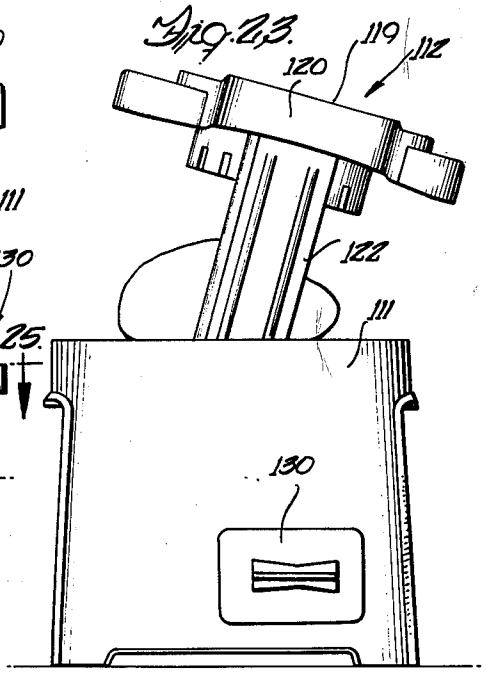


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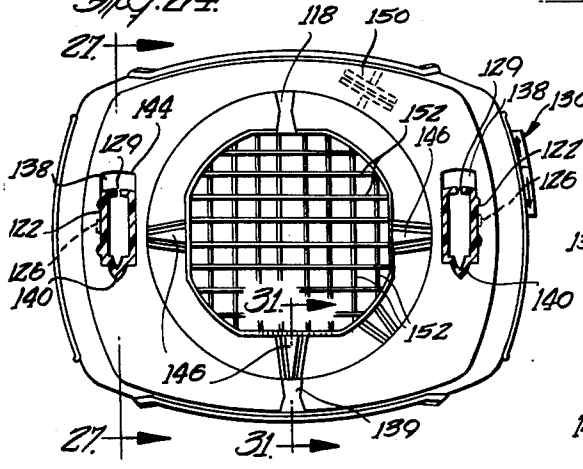


Fig. 25.

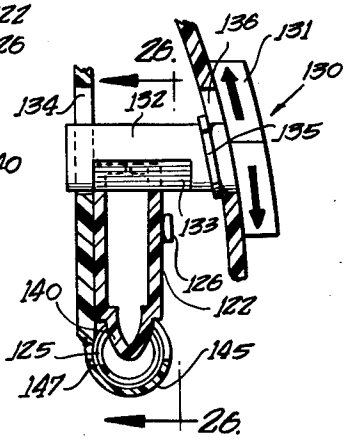
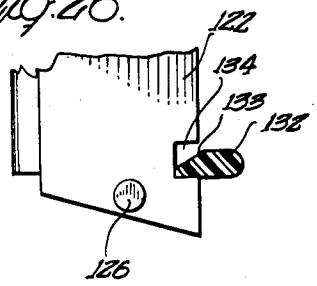


Fig. 26.



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VARIABLE CUT DICER-SLICER

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Fig. 27.

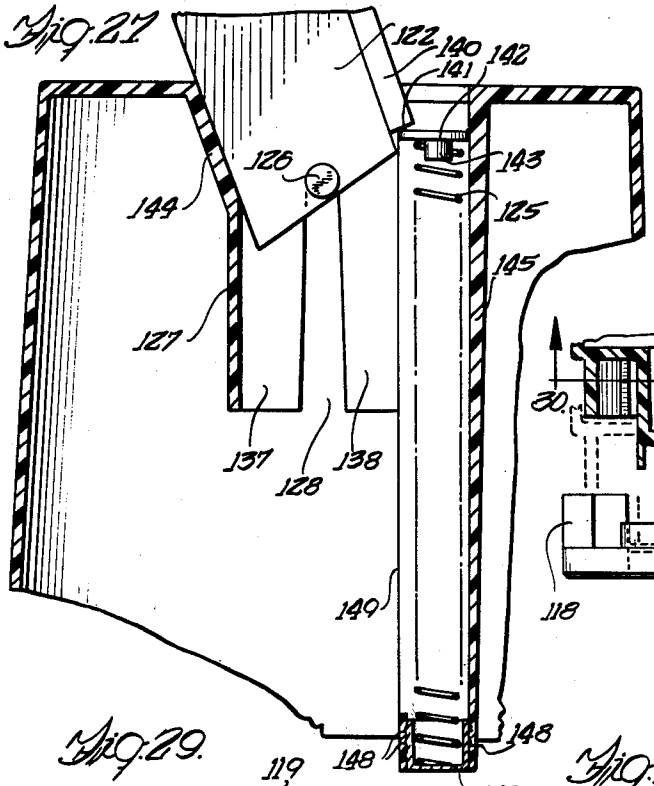


Fig. 28.

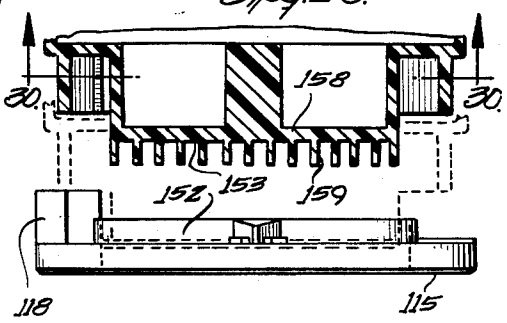


Fig. 29.

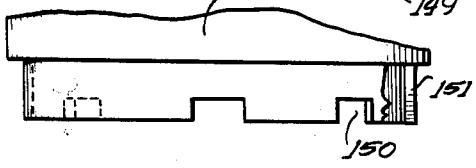


Fig. 30.

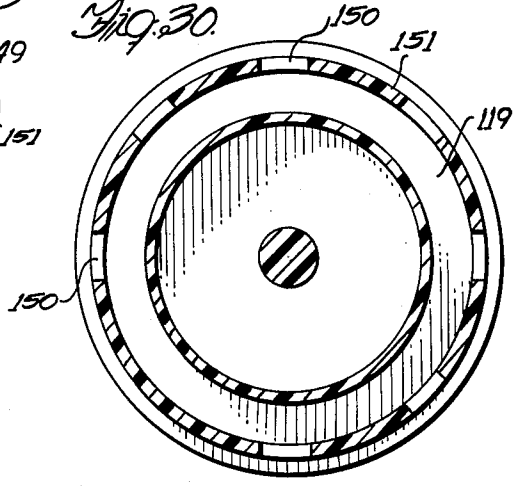
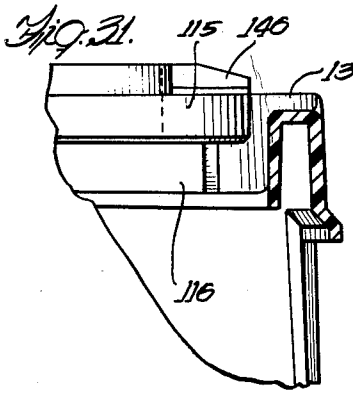


Fig. 31.



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Dec. 3, 1963 S. J. POPEIL 3,112,781

VARIABLE CUT DICER-SLICER

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Fig. 32.

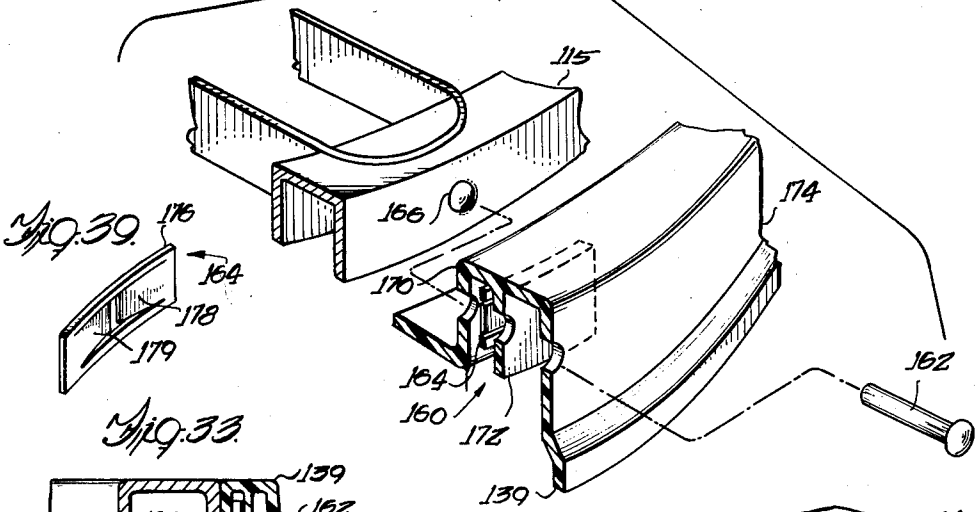


Fig. 39.

Fig. 33.

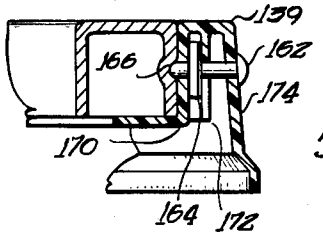


Fig. 34.

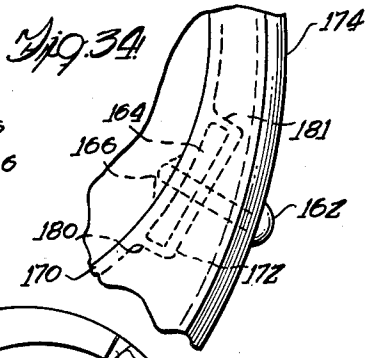


Fig. 35.

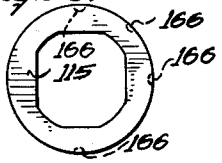


Fig. 36.

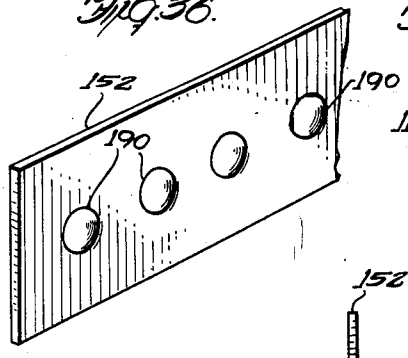


Fig. 38.

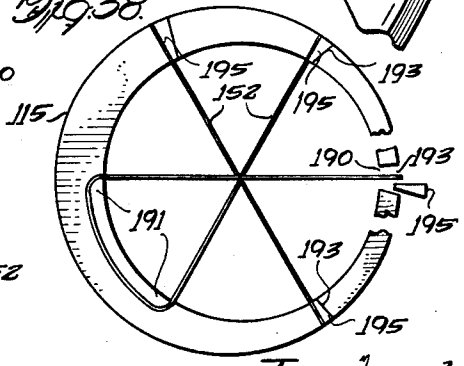
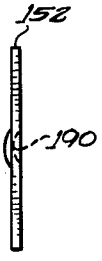


Fig. 31.



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United States Patent Office

3,112,781

Patented Dec. 3, 1963

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VARIABLE CUT DICER-SLICER

Samuel J. Popeil, 2920 Commonwealth Ave., Apt. 5A, Chicago, Ill.

Filed June 6, 1960, Ser. No. 38,689
11 Claims. (Cl. 146—169)

This application is a continuation-in-part of my copending application Serial No. 847,734, filed October 21, 1959, now abandoned.

The present invention relates to a variable cut dicer-slicer, which finds its utility in the preparation of raw and cooked vegetables, fruits, and other foods. Although the primary contemplated use for the device is in the household kitchen, it will be appreciated, as the following description proceeds, that it has an unusually wide variety of applications commercially.

Dicers, slicers, wedgers and cutters have been heretofore proposed as various separate units. With the home kitchen becoming progressively more mechanized, homemakers are reluctant to give space to single-purpose items. The present device, however, by providing for a unique interrelationship between a pair of parallel blade cutter rings, may be used as a dicer-slicer, multiple-cut slicer, and variable thickness slicer, which will handle, for example, an entire tomato with one push. It can also dice onions into hundreds of small squares, or it can cut carrot sticks, french fries, dice beets, and slice pickles. Many of the slicers which have been heretofore used employ separate pushers, or finger guards, or presuppose that the user will exercise sufficient care and caution to prevent cutting the fingers. With the present device, the pusher is utilized for the cutting operation, thereby holding to the irreducible minimum the possibility of injury to the user, even when large volumes of food are processed.

Additionally, in order to facilitate storage in a compack unit, the subject device may be provided with a storage lock which serves to lock the pusher in the down position for storage in a kitchenette cabinet when out of use.

In view of the foregoing, it is one of the primary objects of the present invention to provide a variable cut dicer-slicer which will enable the operator, with one or two operational strokes, to multiple-cut whole fruits and vegetables.

A further and related object of the invention is to provide a variable cut dicer-slicer which, by double processing of foodstuffs, can cut dices, both small and large sizes and in varying shapes, shoestrings, juliennes, and a wide variety of additional cuts.

Still another object of the invention is to provide a variable cut dicer-slicer which, in addition to the foregoing features, is susceptible of use in cutting various fruits and vegetables, such as lemons, apples, pears, hard-boiled eggs, and tomatoes, into longitudinal wedges. Radish flowers may also be prepared.

A further and most important object of the invention is to furnish a variable cut dicer-slicer in which the safety to the operator is maximized, and the hands need never be employed directly in contact with the foodstuffs to be sliced.

Another feature and important objective of the present invention is to provide a variable cut dicer-slicer, the top of which can be locked in the down position to reduce the bulk of the unit for storage in a kitchen cabinet,

and simultaneously shield the cutting blades from damage during storage.

A still further object of the invention is to provide a variable cut dicer-slicer with an interlock mechanism which positively correlates the relationship between one cutter ring and another cutter ring to give the wide variety of cuts desired, while simultaneously serving to prevent breaking of the blades by an improved mesh with the pusher if the exact proper adjustment has not been made.

An even further object of the invention is to provide a variable cut dicer-slicer with highly prestressed blades of such a configuration and combined relationship with a second similar set of blades that raw foods and other substances can be cut with a slight hand pressure heretofore unexperienced.

Further objects and advantages of the present invention will become apparent as the following description of an illustrative embodiment proceeds, taken in conjunction with the accompanying drawings, shown for illustrative purposes, in which:

FIGURE 1 is a perspective view taken from an elevated location of the subject dicer and slicer.

FIGURE 2 is an enlarged top view of the dicer-slicer shown in FIGURE 1.

FIGURE 3 is a side view of the subject dicer and slicer with the pusher top portion set at an angle.

FIGURE 4 is a front elevation of the subject dicer and slicer illustrating the location of a potato or similar item of foodstuff prior to slicing.

FIGURE 5 is a subsequent and sequential view to FIGURE 4 illustrating how the top of the dicer and slicer is depressed and cuts the food.

FIGURE 6 is a view on an enlarged scale of the pusher portion of the dicer and slicer taken generally from the elevation shown at section lines 6—6 of FIGURE 4.

FIGURE 7 is an enlarged, partially broken, view of the pair of cutter rings illustrating their orientation for cutting thin slices, the phantom lines and perspectively shown slice adjacent the pair of cutter rings representing the potato or similar foodstuff and the portion therefrom cut by the blades in the FIGURE 7 configuration.

FIGURE 8 is a similar elevation as FIGURE 7 but sequentially indicating a different orientation of the two cutter rings for cutting diamond shape sections.

FIGURE 9 is an elevation similar to FIGURES 7 and 8 showing the blades oriented for the cutting of the squares or elongate sticks.

FIGURE 10 is a subsequent and sequential view of the cutter rings shown in FIGURES 7, 8 and 9 with the blades oriented in juxtaposed parallel relationship in order to cut a thicker slice, exactly twice as thick as that shown in FIGURE 7.

FIGURE 11 is a top view of a cutter ring modified for cutting wedges, the diagrammatic showing adjacent thereto representing a lemon or lime which has been cut wedged-shaped fashion by the wedge cutter.

FIGURE 12 is an enlarged, partially broken top view of the cutter showing particularly the relationship between the cutter rings and the support taken along section lines 12—12 of FIGURE 1.

FIGURE 13 is an enlarged, partially broken, partially diagrammatic, section view of the dicer and slicer shown in FIGURE 12 and taken along section line 13—13 of FIGURE 12.

FIGURE 14 is a perspective, partially exploded view of a cutter ring illustrating the relationship between the blade portion and ring support.

FIGURE 15 is an enlarged, partially broken top elevation of a corner portion of the cutter ring shown in FIGURE 14 illustrating the cuts receiving the convoluted blade and the slot for pinning the blade into place.

FIGURE 16 is an enlarged, exploded, partially perspective and partially broken view of the dicer and slicer showing the relationship between the cutter-ring assembly and the base top portion.

FIGURE 17 shows a series of top elevation views of alternative configurations of the cutter rings with the blades shown in single usage, single loop configuration and double loop configuration.

FIGURE 18 is a perspective view of an alternative form dicer-slicer showing a variation in the reciprocating support and a reversed relationship between the pusher and cutter.

FIGURE 19 is a perspective view of a second alternative and preferred commercial embodiment of the subject variable-cut food dicer and slicer.

FIGURE 20 is a front elevation view on a reduced scale of the food dicer and slicer shown in FIGURE 19 illustrating a potato positioned on the same for cutting.

FIGURE 21 is a top view on a reduced scale of the food dicer and slicer shown in FIGURE 20.

FIGURE 22 is a front elevation view of the food dicer and slicer as shown in FIGURE 20 with the pusher element in the down position, illustrating diagrammatically how the potato is sliced, and also illustrating the configuration of the food dicer and slicer when the top is locked in the down position for storage.

FIGURE 23 is a side elevation view taken from the right side of FIGURE 22 showing the pusher in the elevated position and tipped rearwardly to permit the operator to view the foodstuff while positioning the same on the blades for cutting.

FIGURE 24 is a partially sectioned top view of the cutting elements of the food dicer and slicer taken along section line **24—24** of FIGURE 19.

FIGURE 25 is an enlarged partially broken sectional view of the storage locking mechanism taken along section line **25—25** of FIGURE 22.

FIGURE 26 is an enlarged, partially broken, partially sectioned view of the locking mechanism taken along section line **26—26** of FIGURE 25.

FIGURE 27 is an enlarged, partially broken, sectioned view of the pusher element and spring return mechanism taken along section line **27—27** of FIGURE 24.

FIGURE 28 is a partially sectioned, partially broken, partially diagrammatic view of the interrelationship between the pusher top and the upper portion of the base taken along section line **28—28** of FIGURE 21.

FIGURE 29 is a front partially broken view of an internal portion of the pusher showing the interlock safety ring of the pusher top.

FIGURE 30 is a transverse sectional view of the pusher top taken along section line **30—30** of FIGURE 28.

FIGURE 31 is an enlarged, partially broken, partially diagrammatic partially sectioned view showing the relationship between the lower ring and upper ring with the top of the base member.

FIGURE 32 is an exploded perspective view taken along a cross-section appropriate for illustrating the spring-loaded detent assembly.

FIGURE 33 is a side cross sectional view of the spring-loaded detent assembly.

FIGURE 34 is an enlarged top view of the spring-loaded detent assembly.

FIGURE 35 is a top view of the top cutter ring showing cooperating means engageable with the detent assembly.

FIGURE 36 is an enlarged perspective view of the end of the cutting wires where they engage the frame.

FIGURE 37 is an end view of the member seen in FIGURE 36.

FIGURE 38 illustrates an assembly of elements for a cutter ring, and has a section broken out therefrom to illustrate details of assembly.

FIGURE 39 is a perspective view of a spring as used in the detent assembly.

The above outlined objects as well as others which will become apparent hereinafter are achieved by the organization of the variable cut dicer-slicer **10** wherein a base **11** is provided with a pusher top portion **12** which reciprocates axially toward a cutter ring assembly **14** which is housed in the base **11** and in a plane perpendicular with that of the motion of the pusher portion **12**. The cutter ring assembly **14** contemplates two cutter rings **15, 16** with one of the cutter rings (here shown as top cutter ring **15**) radially adjustable with relationship to the other (here shown as bottom cutter ring **16**). The top cutter ring **15** is made radially adjustable, and provided with a safety interlock mechanism **18** which accomplishes the twofold purpose of indexing the top cutter ring to the proper location for various cuts and preventing the pusher top portion **12** from fully engaging the cutter blades in interfit relationship unless the proper adjustment has first been made. As will be noted in FIGURE 3, the pusher top portion **12** is pivotally connected to the base **11** in such a manner that at the initial portion of the downstroke the pusher top portion 12 can be tilted rearwardly in order to provide visual inspection and accurate location of the foodstuffs to be cut by the cutter ring assembly **14** prior to use. Thereafter, the pusher top portion **12** is pivoted over into the cutting position as shown in FIGURE 1 and pushed downwardly while out of the way of any fingers.

By reference to FIGURES 7 through 10, it will be seen that a wide variety of relationships between the top cutter ring **15** and bottom cutter ring **16** are contemplated. Next to each of the figures, is a perspective showing of various food cuts that may be achieved with the adjacent cutter ring assembly settings. It will be appreciated, of course, that the foodstuffs may be run through the cutter ring assembly **16** two or three times, each time with a preselected angular displacement of the cutter ring assembly. For example, if the FIGURE 7 cut is made which makes a parallelism of thin slices, and the operator holds his hand beneath and then places the foodstuff, for example a potato, atop the slicer again after turning 90°, the resulting product is a plurality of shoestrings which are ready for French frying or otherwise processing. On the other hand, the square relationship between the upper cutter blades and the lower cutter blades when achieved, as illustrated in FIGURE 9, requires the operator to process a potato only twice in order to achieve uniform square dices. At least one hundred dices can be cut from the average potato in just two insertions through the unit. In order to give a better illustration of the wide variety of types of cut and work which can be performed by the subject variable cut dicer-slicer, there is tabularized below a listing of the various positions, by a single cut or in combination with a second position on a second or even third cut, and an indication of the results achieved:

Position	Number of Cuts	Type of Product
1. Off-set Parallel (Figure 7)	1	Thin slices.
	2	Shoe strings.
	3	Small dices.
2. 90° Top Angle with Fixed Cutter (Fig. 9).	1	Diamond shaped lengths.
3. 45° Top Angle with Fixed Cutter (Fig. 8).	1	French fries.
4. Parallel Blades (Fig. 10)	1	Thick slices.
1 and 3	1 and 2	Thin diamond dice.
1 and 2	1 and 2	Thin square dice.
4 and 3	1 and 2	Diamond dice.
4 and 2	1 and 2	Square dice.
4 and 1	1 and 2	Rectangular squares.
Wedge Cutter	1	6 wedges 1/6 of lemon and other foodstuffs.

In addition to the foregoing cuts, the following is but a partial list of the type of fruits, vegetables and other

foodstuffs which can be processed in accordance with the cutting configurations outlined above:

Thin Slicing:	
Eggs (hard)	Strawberries
Celery	Peaches
Carrots	Radishes
Potatoes	Cucumbers
Beets	Pickles
Olives (stuffed)	Okra
Boiled Potatoes	Mushrooms
Onions	Garlic
Bananas	
Julienne:	
Potatoes	Beets
Carrots	Cheese
Chops: Onions	
French Fries:	
Potato	Egg Plant
Thick Slicing:	
Green beans	Tomatoes
Celery	Cucumbers
Apples	Egg plant
Diamond Dices:	
Potatoes	Onions
Carrots	Celery
Beets	
Square Dices:	
Potatoes	Onions
Carrots	Celery
Beets	
Small Dices:	
Potato	Carrot
Onion	
Sea Food:	
Shrimp—large slices (cooked)	
Wedges:	
Lemons	Pears
Limes	Beets
Eggs	Radish Flowers
Tomatoes	(partial cut and
Apples	soak in water)

The foregoing advantageous functions achieved by the subject dicer and slicer will permit a more ready understanding of the significance of the various details of construction. Turning again to FIGURES 1, 2 and 3, it will be seen that the pusher top portion **12** is generally circular in nature having a central head portion **19** flanked by a pair of hand holds **20**. The hand holds **20** are rectangular in nature and permit the operator, upon actuating the unit, to place the thumb of each hand atop each hand hold, or the heel of the hand, and press the pusher top portion **12** downwardly to thrust the foodstuff **21** through the cutter ring assembly **14**. The parallel guides **22** are firmly secured at their upper portions to the base of the central head **19**. As illustrated in FIGURE 3, the guides **22** have a pair of grooves **24** near the outer portion of the guide **22** as well as on the inner portion of the guide **22** to engage pins or extensions **25** (see FIGURES 12 and 13) to confine the downward stroke of the central head **19** when depressed by the operator.

A guide pivot pin **26** on either side of the base fixes the guide **22** permanently to the base **11**. The pivot pin **26** rests within the pivot pin slot **28** in the center of the guides **22** and abut against the coil-return spring **29**. The forward portion of the base of the guide **30** is rounded in order to accommodate the guide **22** into the retracted position shown in FIGURE 3 in order to facilitate placing the foodstuff **21** into position for cutting. Guide rails **31** (see FIGURE 13) within the base **11** provide a channel into which the guides **22** are directed for their downward stroke. While the base **11** is generally semi-cylindrical in configuration, a pair of forwardly extending feet **32** may be provided in order to insure stability on a counter top **34** such as illustrated in FIGURE 3.

A circular support portion formed at the upper end of base **11**, and provided with a central open area **36** has a stepped shoulder **38** (see FIGURE 13) which receives and holds the cutter ring assembly **14**. The bottom ring **16** (see FIGURE 14) is provided with offset locking lugs **39** which insure proper orientation through their engagement with locking slots **40** (see FIGURE 12). A locking ball recess **43** in the back of the bottom ring **16** provides clearance when the bottom ring is inserted. Ease of relative rotation between the top and bottom ring is enhanced by index ribs **23** on the upper surface of the top ring **15** and a slip ring rib **37** on the bottom of top ring **15** for easy sliding contact with bottom ring **16**.

In order to selectively position the upper ring **15** relative to the lower ring **16** to provide the various relationships as illustrated in FIGURES 7, 8, 9 and 10, a spring-loaded ball **41** (see FIGURE 16) is held in place at the end of the hollow index rivet **27** and yieldably urged toward the detents **45** in the periphery of the upper ring **15** by means of the spring **42** within the hollow body of the hollow index rivet **27**. The end **44** of the hollow rivet **27** is crimped in order to retain the ball **41** in position. It will be appreciated that the other alternative interlocking constructions, for example, a spring-loaded ball within the upper ring engaging a detent in the lower ring could also be utilized for this purpose. As will be observed in FIGURE 16, suitable numerical indicia **46** are provided in the upper ring **15** keyed to the relative rotation of the upper ring **15** to the preselected relationships between the detents **45** and the locking ball **41** to achieve the orientation indicated in FIGURES 7 and 10.

FIGURES 14 and 15 disclose more completely the structural relationship between the ring (here shown as lower ring **16**), and the convoluted blade assembly **50**. As seen in FIGURE 15, a plurality of blade-mounting pins **48** in the ring **16** adjacent its central open portion are defined by semi-circular blade slots **49**. The pins **48** are positioned in opposed staggered relationship so that the convolutions of the blade assembly **50**, when the curved end portions **51** thereof are placed within the blade slots **49** define a plurality of individual parallel blade portions **52**. A blade-end mounting slot **54** is provided at positions flanking the blade-mounting pins **48**. The ends of the blade are preferably finished with a knurl **56**. A plurality of notches or a crimp may also be used, however, in lieu of the knurl **56**. When the knurl **56** is fitted within the slot **54**, a metal wedge **55** is then driven into the slot **54** and deformingly engages the knurl **56** whereby the ends of the blade assembly **50** are secured to the ring. While the metal for holding the knurl is preferably a deformed portion of a rib **55** adjacent the slot **54**, a separate metal wedge may also be driven into the slot.

Because the blade assemblies **50** are prestressed to an unusual degree, the pusher top portion **12** is provided with a specially adapted pusher member **58** which has a plurality of extending projections **59** prescribing the general pattern exhibited in FIGURE 6. There it will be seen that a plurality of blade channels **60** are defined by the edges of the extending projections **59** which parallel the configuration of the individual blades **52** in the various configurations shown in FIGURES 7, 8, 9 and 10. The construction is such that upon depressing the pusher top portion **12**, the depth of the extending projections **59** flanks the cutting edge of the upper parallel cutting blades **52**. While this does not necessarily insure the complete passage of the foodstuff through the entire cutter ring assembly **14**, the operator can grasp the partially sliced foodstuff **21** from a position slightly above that level shown in dotted lines in FIGURE 5 and pull it through. The advantage of this "hanging by a thread" will be readily understood when, for example, diced potatoes are to be made. Further, it will be seen that diagonal channels meeting at a wedge cut center **61** are provided to accommodate the blades **66** of the wedge cutter. The thin slice channels **63** are only at one 90° displacement from the full

cut channels 67 thereby providing a maximum surface area on the extending projections 59 for pushing the food through the blades.

In accordance with the tabulation shown above, the upper ring 15 and lower ring 16 are oriented into a position where the upper and lower blades are in a vertical plane as in FIGURE 10. The potato is then pushed downwardly through the cutter ring assembly 14 and the cut is similar to that shown in FIGURE 5. The operator then holds the entire potato even though sliced, and inverts it 90° and places it atop the cutter ring assembly 14 after first having reoriented the blade assembly into the configuration illustrated in FIGURE 9 where the upper and lower parallel blades are at 90° angles will each other. Then, when the already laterally sliced potato is pushed thereto, a plurality of dices results. As pointed out above, the average potato will be cut into a least 100 dices in this manner. Similarly, beets and other vegetables can be diced for cooking.

In order to assist the operator and further insure the safe operation of the unit without risk of damaging the blades by engagement with the extending projections 59 on the pusher member 58, a safety interlock projection 18 is provided which extends upwardly from the upper cutter ring 15. The interlock mechanism 18 prevents the central head 19 from descending its full stroke unless the pockets 17 are aligned with the projection 18. As the upper ring 15 is rotated to the various stations as indicated by the numerical indicia 46 (or other marking indicia) which may be based on the outer ring of the circular support portion 35 of the base 11, and the spring-loaded locking member 41 engages the spaced detents 45 on the upper ring 16, the projection 18 will readily nest within the pocket 17 in the central head 19. In the event, however, that the channels 60 of the pusher member 58 would not be properly lined up and thus invite damage to the blades 52 by contact with the lower ends of the extending projections 59, the upper portion of the interlock mechanism 18 would abut the lower rim of the central head 19 and prevent the extending projection 59 from contacting the parallel blades 52.

In order to provide for additional cuts, such as a wedging cut for lemons, limes, applies, pears and the like, an alternative configuration of cutter ring as illustrated in FIGURE 11 may be provided. There it will be seen that the cutter ring 62 is circular in external configuration with an offset open circular portion in its middle. A locking notch 68 is provided in the periphery in order to engage the locking boss 40 adjacent the stepped shoulder 38 as used against the lower ring 16. The blades in this configuration are two in number, the blades defining a modified figure 8 with their respective cutting elements 66 prescribing angles of 45° with the adjacent cutting blades. A somewhat crescent-shape slot 65 is provided at one end, and opposed thereto are a pair of individual slots 69 to receive the ends of the blade. The ends of the blade are knurled and then peened into the slots 69 much as the ends of the convoluted blade as described above.

The blades must be prestressed prior to securing in place. With a $^{10}/_{1000}$ inch blade $^{8}/_{1000}$" wide, a prestressing in the range of 100 to 200 pounds per blade will permit satisfactory cutting. It will be realized that a blade of the indicated cross section dimensions, will be prestressed within a range of 125,000 #/in.^{2} to 250,000 #/in.^{2} when the tension force ranges between 100 to 200 pounds. A stainless clock spring steel, which has a maximum tensile strength of approximately 300,000 #/in.^{2}, produces excellent results. If the blades are not sufficiently prestressed, jamming occurs and the force required to cut the foodstuffs becomes excessive. In the event the blades are prestressed excessively, the cutter rings may be distorted, and although the blades will cut satisfactorily, their life expectancy will be shortened. Thus, the prestressing of the blades to a point which permits easy passage of food is critical. The degree of prestressing for various blades can be determined and checked by plucking the blades and checking their pitch. For example, the pitch of a $^{6}/_{1000}$ inch blade $^{1}/_{1000}$ inch of blued carbon steel, of a length as would provide optimum cutting action in a device made in accordance with the principles of the invention, should be at least 2400 cycles per second (c.p.s.) and for best results not in excess of 3200 c.p.s. The stainless clock spring behaves similarly.

While the foregoing description of the blades and cutter rings show a technique for employing a continuous-type blade, alternative constructions are contemplated such as those shown in FIGURE 17. In FIGURE 17(*a*) a configuration is shown wherein single blades 52 are contemplated. Each of the blades has an end construction similar to that illustrated in FIGURE 14 with a knurl for anchoring within the slot 54. The configuration shown in FIGURE 17(*b*) contemplates a plurality of single loop blades 52, pairs of the ends of which are provided for wedging into position at opposed stations defined by slot 54 within the ring. Still another alternative configuration with a double loop blade and locking slots at opposed portions of the ring is shown in FIGURE 17(*c*). There it will be seen that the recessed crescent members 48 are provided as illustrated in FIGURE 14 with opposed staggered slot portions 54 in order to stake the double-looped blades into position.

As shown in FIGURE 18, by reversing the cutter ring assembly and pusher, an alternative form dicer-slicer 80 may be produced. A handle 81 is fixed to the movable cutter ring assembly 82 which reciprocates along a single support post 84. The foodstuffs are supported on a stripper head 85 on a support 86 which, in turn, is fixed to the stand 88 which supports the post 84. The cutter blades 89 are then advanced toward the grooves in the stripper head 85 as contrasted with the first embodiment. The other interrelated elements are similarly transposed.

To prevent a loss of tension in the blades after they have been assembled within the rings 15, 16, provision may be made for reinforcing the ring construction. As shown in FIGURES 10 and 17(*a*), a slot 71 is provided parallel with the blades and alongside the central openings of the rings. The slot is subsequently filled with a steel reinforcing rod 72 which is prepared slightly oversize and press-fitted into the slot 71. The rod 72 then serves to strengthen the ring 15, 16 at its four corners, which are critical stress points, and prevent a slow loss of tension in the blades 52 due to a pressure deformation of the ring 15, 16.

The second alternative, and preferred commercial embodiment of the variable cut dicer-slicer 100, as shown in FIGURES 19–22 utilizes a pusher member 112 with a pair of flanking hand grips 120 and a central head portion 119. A pair of guides 122 extend downwardly from the hand grips 120. The guides 122 are yieldably and slideably supported within the base 111 in a manner to be described hereinafter. As will be noted from FIGURES 19 and 20, the base comprises an outer shell 113 and inner side walls 114 thereby defining a tunnel-like opening 117 to receive cutting dishes and the like into which the foodstuffs 121 fall after being cut. A cutter ring assembly, supported in the top 139 of the base as in the other embodiments, is provided with a top ring 115 and a bottom ring 116 (FIGURE 31), each of the rings having a plurality of parallel blades 152. The parallel blades 152 are engaged by the extending projections 159 beneath the lower portion 158 of the pusher member 112.

Referring now to FIGURES 25 and 26, it will be seen that a unique locking assembly 130 has been provided. The lock comprises a handle 131 having an interior shaft portion 132. The interior shaft portion 132 has a roughened tapered face 133 which engages a notch 134 in the guide 122. A snap ring 135 secures the shaft from lateral disengagement by abutting the periphery of

the lock slot 136 in the outer portion of shell 113 of the base 111. Thus when the dicer-slicer is to be placed out of use, the pusher 112 is lowered to the position shown in FIGURE 22, and the handle 131 of the locking assembly 130 is moved forwardly whereupon the shaft 132 engages the locking notch 134. In this configuration the dicer-slicer takes up the least cupboard space, and additionally the pusher top extensions 159 are clearly engaged in a guarding relationship with the parallel blades 152. Thus a two-fold purpose is accomplished by reducing the size of the unit for storage, and protecting the blades from any damage which could occur from falling objects in a kitchen cupboard and the like.

The structure for receiving the guides 122 of the pusher 112 is best illustrated in FIGURE 27. It is seen that a guide rail 127 is provided at a portion in the wall of the base along with a web 137 which contains the pivot pin slot 128. By providing a longitudinal slit 129 (see FIGURE 24) in the rear of the guide 122, the side portions of the guide 122 can be squeezed together to permit the pivot pin 126 to fit within the guide slots 138 and thereafter, upon releasing, the pivot pin 126 extends into the pivot pin slot 128.

The V-shaped forward extension 140 of the guides 122 has a return spring shoulder 141 at its lower end which rests atop the return spring cap 142. A stud 143 extends downwardly from the return spring cap 142 and nests within the central portion of the return spring 125 thereby serving to transmit the upward force of the return spring 125 onto the guide 122. An angled support shoulder 144 extends from the upper portion of the rail 131 and provides an abutting surface for the guide 122 when it is tilted rearwardly into the configuration shown in FIGURE 23. As shown in FIGURE 25, the return spring 125 abuts forwardly against the wall 145, and is contained in the opposite direction by means of ribs 147. Thus in assembly, the return spring 125 is placed into position and snapped through the ribs 147 until it approximates the wall 145. Thereafter the return spring cap 142 is placed into position, and the return spring base socket 149 is force-fitted into position and held in place by means of the base socket barbs 148.

The top ring is rotated in much the same manner as the other embodiments heretofore discussed, and the relationship between the blades 152 of the upper ring 115 and those of the lower ring 116 are substantially the same. A spring-loaded detent assembly 160 (see FIGURE 32) engages corresponding positioned elements on the upper ring 115 so that when the various indicia 146 are positioned appropriately at the front portion of the unit as indicated by the lower ring locking lug 139, the cuts in accordance with the predetermined usage may be achieved.

A safety ring 151 is provided in the head 119 to prevent damaging the parallel blades 152 by means of pushing the top pusher element 112 too far downwardly. In FIGURES 28 through 30, it will be seen that the safety locking lug 118 on the upper ring 115 is proportioned to engage a plurality of locking slots 150 in the safety ring 151 which depends peripherally from the pusher central head 119. In this manner, the slot bases 153 defined between the downwardly extending projections 159 are prevented from engaging the blades 152.

In FIGURE 32 is seen an exploded cross-sectional detail of the spring-loaded detent assembly 160 and the manner of mounting the same on the top 139 of the base member 111. The detent assembly includes a pin 162 that is urged by a flat spring 164 (FIGURE 39) into engagement with a pin recess 166 that is disposed in a vertical face of the ring 115. Preferably, a plurality of such recesses is disposed peripherally around the vertical face of the ring 115 in the fashion illustrated in FIGURE 35. The pin 162 has a rounded end to facilitate its sliding in and out of the pin recesses during indexing. The pin 162 corresponds to and is an alternative embodiment of the index rivet 27 of FIGURES 14 and 15. The spring 164 is disposed between the inner wall 170 of the base 139 (the wall that faces the vertical periphery of the ring 115), and an intermediate vertically depending wall 172. The pin 162 passes through a plurality of holes in the base top 139, all of the holes being linearly aligned and there being one each in the walls 178, 172 and the outer wall 174 of the base top 139.

The spring 164 comprises a spring body member 176 with a pair of mutually inwardly facing, outwardly struck central tabs 178, 179. The tabs are so struck as to provide a central space therebetween, whereby the pin 162 passes between the tabs and is resiliently firmly engaged thereby. The spring body is preferably bowed and the entire spring 164 is mounted between the inner and intermediate walls 170 and 172. The mounting is in such fashion as to continuously urge the pin 162 inwardly, whereby it is continuously urged into that one of the recesses 166 which is presented to the pin. In this fashion the pin supports the spring to give a positive means for preventing the spring from falling out from between walls 170 and 172. This, of course, is because the pin passes between the ends of the struck out resilient tabs 178, 179. Moreover, the resiliency of the spring itself is such as to provide a resilient frictional engagement between the spring and the walls 170, 172 between which it is located.

As seen in FIGURE 34, the spring 164 is bowed by the ends thereof being urged together continuously by engagement with the end walls 180, 181 which extend between the respective ends of the short intermediate wall 172 and the opposed portions of the inner wall 170. The head of the pin 162 is preferably formed with its under side sloped for appropriately and smoothly engaging the outer periphery of the wall 174.

As mentioned above with respect to FIGURES 14 and 15, the blade portions 152 (or their corresponding members in FIGURES 14 and 15—element 52) are secured in the ring 115 in a unique fashion. A similar construction applies to the ring 116. Referring now to FIGURES 36 through 38, the end of the cutting blade 152 is dimpled by a plurality of partially spherical indentations 190. When the springy, resilient member constituting the blade 152 has been placed in position in the ring 115, as by wrapping it around the anchor posts 191, the ends of the blade are then placed in a slot 193 that is formed in one portion of the periphery of the ring 115. The slot is wedge-shaped in such a fashion as to receive a wedge 195. In other words, the sides of the walls defining the slot are non-parallel and in the preferred embodiment the radially outer end of the slot is of larger dimension than the radially inner end. With this structure, the blades 152 are placed in position, one or more of the dimples 190 on one end of the blade are aligned with one of the walls defining the slot 193 (preferably a wall that extends radially), and a wedge 195 is driven into slot to seal the dimples very tightly against the coacting slot-forming wall. Then tension is placed upon the blade 152 to pull it sufficiently tight, and a second wedge 195 is driven in to secure the dimples 190 on the other end of the blade up against the wall of the slot. In the embodiment of FIGURE 38, a 6-wedge cutter is shown. In this instance, two are used, one being crossed upon itself and the other being straight. The same general procedure for assembly of each into the ring is followed. It might be noted that the anchor posts 191 correspond generally to the elements 38 of FIGURES 14 and 15. With this unique construction, the tension is employed to pull the wedge into the slot, whereby an unusual self-locking action is obtained.

Inspection of FIGURES 11 and 38, demonstrates that the opening across which the blades 152 are disposed can be eccentrically mounted relative to the outside of the ring 115. The reason for this eccentricity is to make

the point of intersection of the blades **152** (FIG. 38), generally coincide with the geometrical center of the pattern formed by the projections **59** of the pusher member **58**. To permit the obtention of thick slices, thin slices and other such variations rotation of the ring **115** to a proper position is made, and detention of the ring thereat is assured by the detent assembly **160**. For example, suppose thick slices are desired. A convoluted cutter such as shown in FIGURES 7–10 is selected and is positioned with the blades thereof parallel to and vertically aligned with those on the lower cutter **116**. The vegetable is then pushed through the cutters and thick slices are obtained. Suppose, however, that thin slices are desired. In such case the ring **115** (or **15**, it being a corresponding element) is rotated 180°, whereby the straight portions with the convolutions are parallel to those on the lower ring **16** (or **116**), but are not in alignment therewith. In this fashion, thin slices approximately one-half the thickness of the distance between the adjacent portions of the convolution, are obtained.

In review it will be seeen that the second alternative embodiment and preferred commercial embodiment retains all of the features of the first embodiment, and adds the additional features of a lock to simultaneously reduce the size of the dicer-slicer for storage, and to protect the blades **152** when out of use. Additionally, the assembly of the guides **122** within the base member, and their cooperation with the coil spring has been simplified from a cost standpoint, and yet a durable construction has been achieved. The provision of an angled support **144** to hold the guides **122** in a rearward position for starting also improves the construction and strength of the unit. A safety interlock has further been provided to prevent damage to the blades when operated by an over-zealous user.

Although particular embodiments of the invention have been shown and described in full here, there is no intention to thereby limit the invention to the details of such embodiments. On the contrary, the intention is to cover all modifications, alternatives, embodiments, usages and equivalents of the dicer-slicer as fall within the spirit and scope of the invention, specification and the appended claims.

I claim:

1. In a food cutting device, a cutter ring comprising, in combination, a ring, said ring defining a central open portion, a plurality of alternately opposed crescent shaped blade mounting pins flanking the central open portion of the ring thereby presenting opposed mounting stations, a single continuous convoluted ribbon-like blade passing in intimate prestressed fit over the mounting pins thereby presenting a plurality of parallel cutting elements, a pair of mounting slots flanking the mounting stations, and interacting deformable means lockingly fixing the blade ends in the mounting slots to effect a prestressed condition in the blade within the ring.

2. A cutter ring according to claim 1, wherein a pair of wedges are provided for deformingly locking the blade ends into the mounting slots.

3. A cutter ring according to claim 1, wherein the blade is prestressed to at least to at least half of its maximum tensile strength.

4. A cutter ring according to claim 1, wherein the blade ends are dimpled to augment the deformable locking action.

5. In a food cutting device, a wedge cutter ring comprising, in combination, an annular ring, a segmental anchor post along an inner edge of the ring, means defining a pair of opposed mounting slots across the ring open area from the anchor post, a single blade wrapped around the anchor post with its ends terminating in the mounting slots, deformed portions on the ends of the blades, and means for deformingly and prestressingly locking blade ends in the mounting slots, thereby presenting non-parallel cutting blade portions for wedge cutting of foodstuffs and the like.

6. A wedge cutter ring according to claim 5 wherein a second single blade is secured across the open portion aligned with the intersection of the blade intersection of the first blade thereby defining six wedge cutting elements intersecting sequentially at 60°.

7. A cutter ring according to claim 5, wherein a pair of wedges are provided for deformingly locking the blade ends into the mounting slots.

8. A cutter ring according to claim 5 wherein the blade is prestressed to at least half of its maximum tensile strength.

9. A variable cut-dicer-slicer comprising, in combination, a frame, a cutter ring positioned within the frame, a pusher, said pusher having a head and a guide leg depending therefrom, a guide pin near the end of the guide leg, elongate confining means in the frame proportioned to reciprocatingly receive the guide leg and guide pin in predetermined operative relation with the cutter ring, said confining means including an angled shoulder at its upper portion to support the guide leg at the upper position of the pusher whereby the pusher head may be retracted as pivotally directed by the pivot pin, confining means, and angled shoulder to permit the insertion and visual alignment of foodstuffs and the like on the cutter ring.

10. A variable cut-dicer-slicer according to claim 9 wherein the confining means includes a compression spring and retaining tube means engageable with and parallel to the guide leg to yieldably urge the pusher away from the cutter ring.

11. In a dicer-slicer of claim 9, locking means for securing the pusher head in close proximity to the cutter ring, said means including a shiftable member, said shiftable member engaging a portion of the frame and a portion of the pusher.

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