United States Patent

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[73] Assignee **said Ward assignor to said Sanders**

[54] **CUTTING APPARATUS**
3 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **146/169**
[51] **Int. Cl.** **B26d 3/26**
[50] **Field of Search** 146/169, 78.1

[56] **References Cited**

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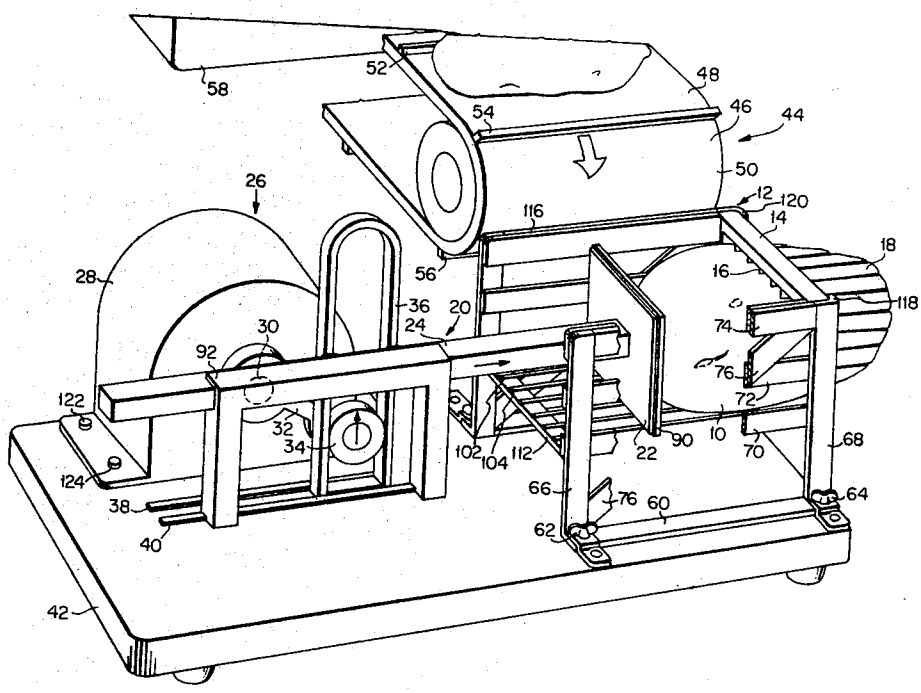
ABSTRACT: A basket for holding a vegetable has a cutter mounted at one end. A reciprocating rod and piston assembly forces the vegetable through the cutter. A motor driving the rod and piston allows automatic, timed loading of vegetables into the basket.



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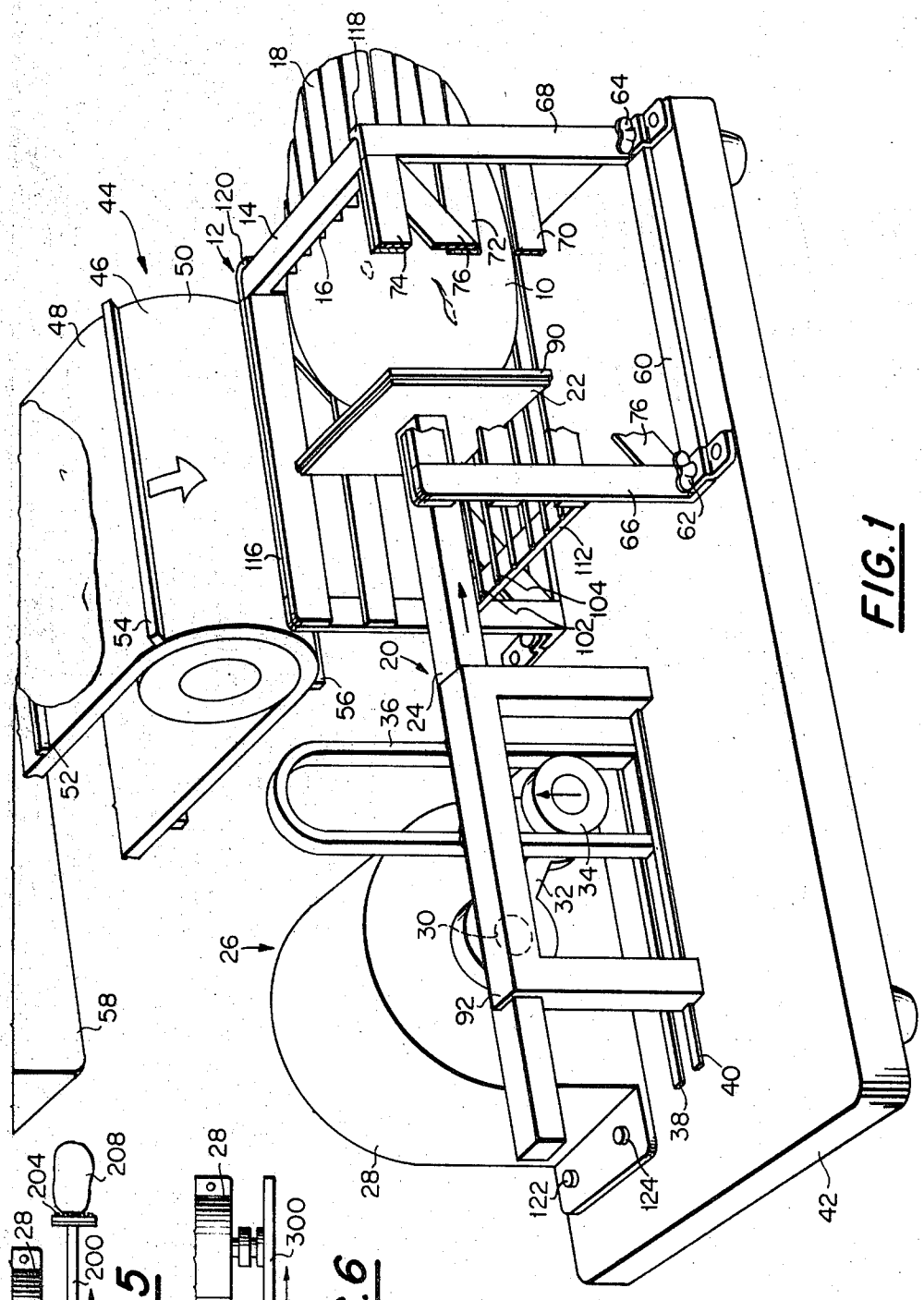

FIG. 1

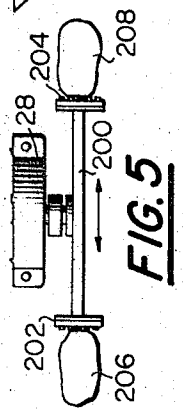

FIG. 5

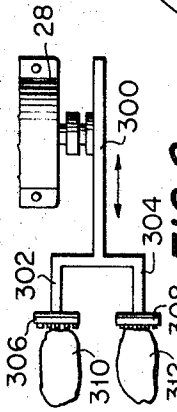

FIG. 6

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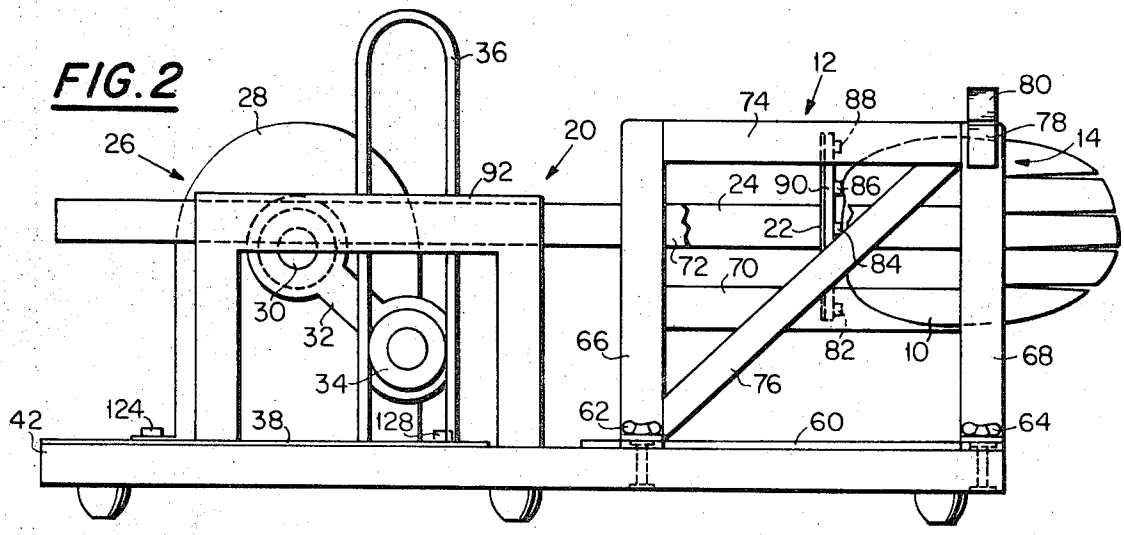
FIG. 2



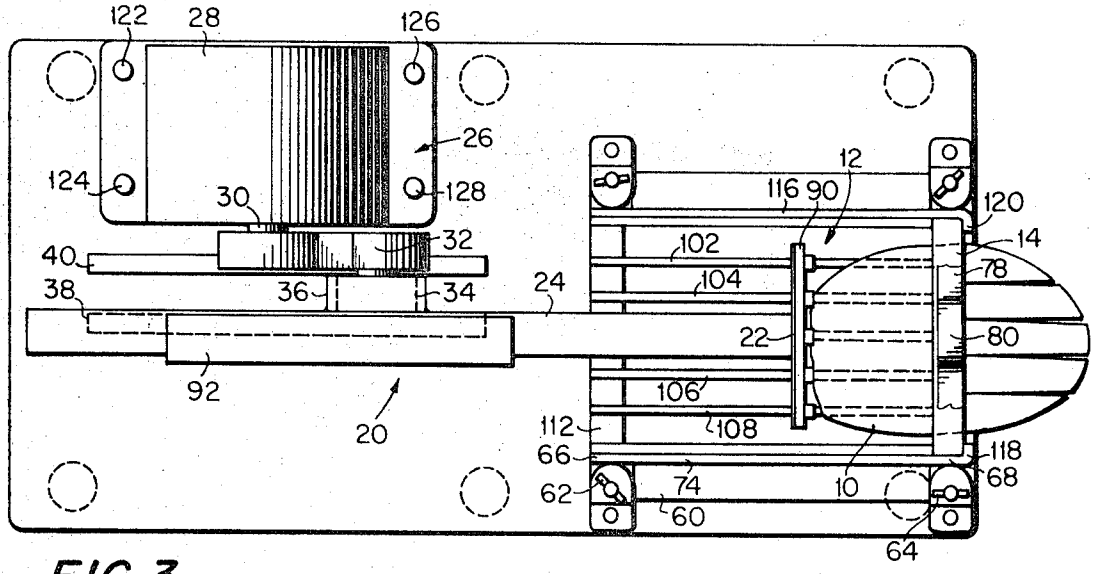


FIG. 3

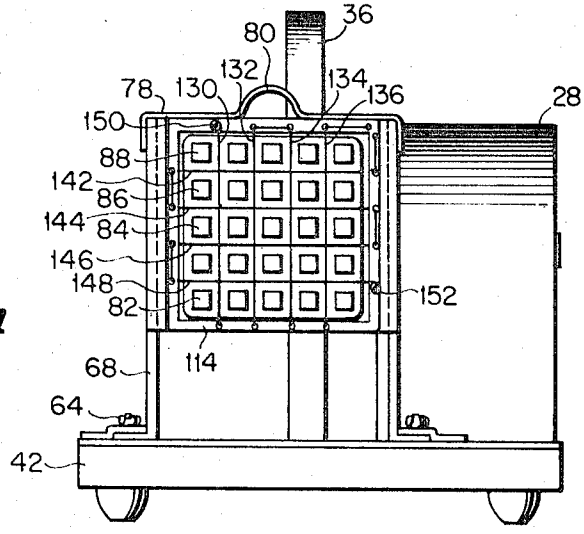


FIG. 4

CUTTING APPARATUS

FIELD OF THE INVENTION

This invention relates generally to the field of cutting solid elements, such as vegetables and fruits, into segments. It is particularly suited for commercial and home applications and for cutting potatoes into the commonly known "french fry" shape.

DESCRIPTION OF THE PRIOR ART

Cutting of vegetables and fruits in the past has been a time-consuming, multistep operation—both when done in the home and commercially.

Cutting potatoes into "french fry" shapes has been particularly difficult. In commercial applications, where it is necessary to process several tons of potatoes per week for subsequent freezing and packaging, the industry has resorted to complicated electromechanical equipment, requiring at least two passes (or cutting operations) per potato. Typically, in the prior art, the potato is loaded and then cut along its longer axis into a number of platelike segments. Those segments must then be reloaded and cut once again along their longer axis into the "french fry" shaped segments. In addition to the multiplicity of steps required, the prior art has been characterized by notably complicated loading of the potatoes into the cutting region.

In lower volume industrial applications, as well as home applications, the equipment has been mainly manually operated. Although some prior art devices have cutters and means for forcing the vegetables through the cutters, it is necessary to manually return the noted means to their original position before another vegetable can be loaded. This requires more time and effort from already busy machine operators and/or housewives. Sometimes, the return stroke in such equipment does not travel to full length, thereby causing the vegetable to be loaded improperly. Improper loading either requires reloading or, worse yet, results in the vegetable being smashed rather than sliced.

Prior art equipment has been plagued with other problems as well. For example, the equipment available today is difficult to clean and to adjust. Frequently, it can even be dangerous to operate. The highly complex versions of manual equipment pose particular hygienic problems when food particles become trapped in their various parts.

All these, and other problems of the prior art, lead us to state that it is a primary object of our invention to improve the art of cutting solid elements, such as vegetables and fruits.

A more detailed object of our invention is to provide improved apparatus for automatically slicing vegetables (which term hereafter includes fruits as well).

A more particular object of our invention is to provide apparatus especially suited for slicing potatoes into the familiar "french fry" shape.

SUMMARY OF THE INVENTION

In accordance with one aspect of our invention, and stated broadly, apparatus for cutting solid elements, such as vegetables, is disclosed. That apparatus includes a basket for holding the vegetable. Mounted securely at one end of the basket is a replaceable cutter element. A reciprocating rod and piston assembly forces the vegetable through the cutter. A motor driving the rod and piston assembly through a drive linkage allows automatic, timed loading of vegetables into the basket.

In accordance with another aspect of our invention, the equipment disclosed can be modified to cut a number of vegetables simultaneously. This is accomplished by providing a plurality of baskets and associated cutters and by mounting a plurality of pistons on one reciprocated rod. The pistons can either be mounted in a tandem relation on opposed ends of the rod, or alternatively, in a forked manner on either, or both, ends of the rod.

The apparatus of our invention offers a number of distinct advantages. It vastly increases the speed of vegetable cutting by making automatic what has been a manual operation. In the cutting of potatoes into "french fries," it cuts the number of steps required by prior commercial equipment in half. Even absent other advantages, that improvement alone would speak well for our invention.

Other advantages exist, however. By using a reciprocated, force applying mechanism, there is no need to return the equipment to its original position in a separate step. A simple motor, continuously operating, enables one to feed potatoes one after the other rapidly into the basket for cutting. This feeding can be accomplished either manually or automatically. The reciprocated mechanism can also be adapted to push against, and thereby cut, a number of potatoes (or other vegetables) at one time.

The cutter elements can be easily removed, either for cleaning or for replacement with other, different-shaped cutter elements. The piston assembly can be fitted with a resilient cap member, which can also be removed for easier cleaning. Various frictional surfaces can be formed on, or applied to, the piston surface so as to more surely guide the vegetable. Extensions on the piston matching the portals in the cutter can be provided and expedite forcing the vegetable through the cutter. These extensions are of particular value when the vegetable being cut is still wet from a prior washing operation, for example. Various guide rails can be provided on the floor and sides of the basket so as to guide the vegetable better as well. A cover can also be placed over the basket so as to guard against one's fingers being accidentally mashed.

Summarizing the advantages, a high-speed, simple, safe apparatus for cutting vegetables is disclosed and claimed.

The foregoing and other objects, features and advantages of our invention will be apparent from the following more particular description of our invention as illustrated in the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

In the drawings;

FIG. **1** is an isometric, or perspective, view of our invention.

FIG. **2** is a side elevation view of our invention.

FIG. **3** is a plan, or top, view of our invention.

FIG. **4** is an end view of our invention.

FIG. **5** is a partially schematic view of our invention, modified to drive a number of force applying structures simultaneously.

FIG. **6** is another partially schematic view of our invention, modified in a different manner so as to drive a plurality of force applying structures simultaneously.

DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. **1** shows an isometric, or perspective, view of apparatus for embodying structurally our invention. The apparatus shown is presently contemplated as a preferred embodiment for our invention. It will be described in relation to cutting a potato into a "french fry" shape.

With reference to FIG. **1**, a potato **10** is shown seated in a basket **12**. Mounted rigidly, but replaceably, at the right-hand end of basket **12** is a cutter **14**, comprising an array of blades, only one of which, blade **16**, is numbered.

From the slices, such as slice **18**, in potato **10**, one can tell that potato **10** is being driven through cutter **14**. This is accomplished by the coaction of forcing (or force applying) means **20**. Forcing means **20** include, in this preferred embodiment, a piston and rod assembly, having as elements, piston **22** and rod **24**.

In order to force potato **10** through cutter **14**, it is necessary to drive forcing means **20**; drive means **26** accomplish this. Drive means **26** include a source of motive power, like electric motor **28** having an output, or drive, shaft **30**, rotated by motor **28**. Connected to shaft **30** is a rigid member **32** and that has a perpendicular extension, such as roller **34**, affixed

thereto. Roller 34 is constrained by generally rectangular element 36 and that, in turn, is connected to rod 24. In addition, element 36 is guided, or restrained, by guide rails 38, 40 which are rigidly connected to a supporting structure, or base, 42. In the preferred embodiment, motor 28 and basket 12 would also be rigidly connected to base 42, thereby insuring inter alia, freedom from objectionable vibrations, plus alignment of elements, compactness and pleasing appearance.

FIG. 1 also shows the provision of an automatic feeding assembly 44 which can comprise an endless belt 46 having compartments 48, 50 for receiving potatoes. Compartments 48, 50 are formed by vertical elements 52, 54, 56 extending transversely across belt 46. The spacing of elements 52, 54, 56 is determined by the frequency of reciprocation for forcing means 20 as well as the speed of rotation of shaft 30, as will be explained more fully hereafter. Of course, a supply of potatoes, such as bin 58, must be provided. Bin 58 is shown schematically; in actual practice, it may be any any shape suited for holding a supply of potatoes and capable of providing them, by gravity for example, to belt 46.

Having set forth the basic structural elements for a preferred embodiment of our invention, the operation of those elements will now be described.

With continued reference to FIG. 1, a potato is fed from bin 58 to a compartment 48 on endless belt 46. As belt 46 travels, a potato is ejected (or drops) into basket 12; e.g. potato 10. Some means for guiding potato 10 into basket 12, such as a chute, may be provided. However, for ease of access and visual observation, it may be desirable not to have any additional structure between belt 46 and basket 12. Motor 28 rotates shaft 30 clock wise and the rotary motion is translated into reciprocating linear motion by means of rigid member 32, roller 34 and element 36. As element 36 reciprocates, that motion is transmitted to rod 24 and drives rod 24 to the right, thereby bringing piston 22 into engagement with potato 10. Piston 22 then drives, or forces, potato 10 through the array of blades, like blade 16, in cutter 14, thereby forming potato 10 into a plurality of shaped segments. Should the array of blades form a matrix, or grid, the potato 10 will be cut in one pass into a plurality of "french fry" shaped segments.

As potato 10 is ejected from cutter 14 by the continued motion of piston 22, another potato is supplied from bin 58 to endless belt 46. After potato 10 has been sliced, piston 22 is reciprocated by rod 24 as a result of the continued rotation of shaft 30 and coaction of roller 34 and element 36. When piston 22 is reciprocated to a limit point, another potato can be inserted into basket 12 from a compartment, such as compartment 50. Piston 22 then engages that potato as rod 24 is driven via the continued rotation of shaft 30. The cycle of operation is then repeated. Summarizing for a moment, the apparatus of FIG. 1 thus automatically supplies potatoes to a structure which, in turn, and in one pass, automatically cuts the potatoes into a plurality of shaped segments—quickly, easily, cheaply and safely.

Certain features and modifications to our invention, as well as a completed description of the preferred embodiment will be made in connection with the description of the remaining FIGS. 2—5.

Turning then to FIG. 2, which is a side elevation view of our invention, certain features of basket 12, base 42, and cutter 14, can be seen more clearly. In addition, modifications possible to the structure of piston 22 are also visible.

Looking first at the structure of basket 12 in FIG. 2, note that it is formed of a number of braces and support members. As an example, there are two lateral members, only one of which, member 60, is shown, which are held in rigid relationship to base 42 by means of manually adjustable screws 62, 64. Screws 62 and 64 also pass through legs of vertical elements 66, 68. Basket 12 is thereby securely fastened to the base 42, yet, at the same time, the whole basket structure may be removed for simple and easy cleaning. A number of parallel disposed, horizontal members 70, 72, 74 are rigidly connected to vertical members 66, 68 by means of welding, for example. A diagonal member 76 is welded to vertical member 68, as well as vertical member 66, so as to provide additional rigidity. Note the presence of clamp 78; it is formed of a slightly resilient, yet relatively rigid material, such as spring steel, in order to hold cutter 14 in place. As will be seen later, clamp 78 also has an elevated portion, or crown, 80 which enables one to insert his finger therein and remove cutter 14; another cutter blade of a different geometry can be inserted, or the same cutter blade 14 can merely be removed for hygienic (cleaning) purposes. The geometry of basket 12 is generally symmetrical. Therefore, although the right-hand side view is shown in FIG. 2, there are corresponding elements on the left-hand side of basket 12. They are not shown for simplicity's sake.

With continued reference to FIG. 2, and looking more closely at the structure of piston 22, note that in FIG. 2 it has a plurality of extensions 82, 84, 86, 88 shown thereon. Extensions 82, 84, 86, 88 are designed geometrically so as to be aligned with apertures in the grid pattern formed by blades 16 in cutter 14. Extensions 82—88 inclusive thereby render the operation of our apparatus even more effective by serving to apply force on potato 10 in a number of regions directly aligned with the apertures in cutter 14; the segments in potato 10 are thereby forced through the apertures in cutter 14 by a truly positive drive. In addition, extensions 82—88 inclusive serve to remove any remanent particles of the potato being cut at the conclusion of the cutting operation. This is particularly efficacious when the potatoes are wet from a prior operation, like a washing. Should there be particles of a prior potato left on the blades, the next potato may actually ride up along the moist surface of the particles. Driving the particles through cutter 14 eliminates this problem. As shown in FIG. 2, extensions 82—88 inclusive are formed on a resilient cap member 90 which may be inserted over piston 22. Naturally, the geometry of cap member 90 can be adapted so as to provide a snug fit over piston 22 and have a plurality of extensions on its surface which will mesh with the particular geometrical pattern formed by blades 16 and cutter 14. In addition, a selection of caps having different configurations can be provided. It should be recognized at this point that piston 22 need not be so formed with extensions; the only requi rement is that piston 22 provides good frictional engagement with potato 10 during the slicing operation.

With continued reference to FIG. 2, the drive means 26 are also shown in somewhat more detail. Motor 28, shaft 30, element 32, roller 34 and element 36 are all clearly shown. It is necessary, however, to insure that the travel of rod 20 is constrained so as to move in a truly straight line fashion. This requires the addition of guide rails 38, 40, only one of which, 40, is seen in FIG. 2. Guide rails 38, 40 are preferably welded, or otherwise rigidly affixed, to base member 42. Guide rails 38, 40 serve to constrain the motion of element 36. In addition, note the presence of inverted U-shaped member 92. This member is formed of relatively heavy metallic stock and is also rigidly affixed, for example by welding, to base 42. In addition, element 92 has a channel formed therein so as to guide rod 20 during its travel. The guiding structures shown and described in FIG. 2 insure a firm and true application of force from the drive means 26 to the piston and rod assembly 20, 22 so as to insure a good, clean cut of the vegetable (potato 10) being cut.

Having set forth a description of FIGS. 1 and 2, attention will now be turned to FIG. 3. That FIG. is a plan, or top view, of the apparatus forming a preferred embodiment of our invention.

With reference then to FIG. 3, certain additional features will be brought out. Those additional features relate primarily to refinements provided so as to insure a smooth forcing of potato 10 through cutter 14. Looking first at basket 12, note the presence of a number of rails 102, 104, 106, 108. These rails are provided on the floor, as it were, of basket 12 and they are formed of a low friction, preferably smooth surfaced, material; for example, Teflon or stainless steel would be suita-

ble. In addition, rails 102—108 inclusive are welded to members 112, 114 which form part of the basic supporting structure of basket 12; members 112, 114 are in turn welded to vertical members 66, 68 and their symmetrical counterparts.

With continued reference to FIG. 3, note how element 74 and element 116 wrap around cutter 14 by means of extensions 118, 120. Those extensions have continuations formed by means of a lip on element 68 and its symmetrical counterpart. Those extensions provide an important function by providing a necessary lateral force tending to resist the force exerted by potato 10 on cutter 14. Absent the presence of such extensions, or equivalent means, and the presence of the force exerted by clamp 78, cutter 14 could be driven out of position as an attempt is made to drive potato 10 through cutter 14.

With continued reference to FIG. 3, note that the showing of motor 28 is made clearer. Motor 28 is securely fastened to base 42 by means of screws 122, 124, 126, 128. Shaft 30 is shown, as is element 32, roller 34 and element 36. In addition, structure 92 and guide rails 38, 40 are more clearly shown, as is rod 24.

Before leaving FIG. 3, note that the positioning of cutter 14 is shown as extending beyond the lateral support members, such as 70, 72, 74. It has been found by experimentation that this arrangement of cutter 14 results in a smoother forcing of potato 10 through cutter 14 and actually eliminates a jamming problem resulting from the canting of potato 10 within the structure when other dimensional arrangements have been tried.

Turning next to a description of FIG. 4, note that this is an end view showing the structural arrangement of the cutter 14 more clearly. In FIG. 4, the extensions 82—88 on piston 22 are also clearly shown. A matrix, or grid, is formed by means of cutting elements, such as blades 130, 132, 134, 136, 138, 140 in the vertical plane and blades 142, 144, 146, 148 in the horizontal plane. In a preferred embodiment, blades 130—148 inclusive can be formed out of a continuous wire, which is laced in both the horizontal and vertical directions. This wire need not be formed into a cutting edge per se; a cylindrical shape will be satisfactory to cut potato 10 so long as the wire is tightly wrapped about support members such as 150, 152 in cutter 14. Common piano wire can be used satisfactorily. By contrast, the elements of cutter 14 can also be formed out of segments of stainless steel, or other acceptable knifelike elements. In that situation, the individual segments, or blades, would have to be rigidly secured in the frame of cutter 14; this could be accomplished by welding, for example. FIG. 4 also shows more clearly the structure of clamp 78 and the elevated, or crown, portion 80. By providing this feature, it is possible to quickly and easily remove cutter 14 by merely inserting one's finger beneath the crown 80. A cutter of similar geometry can be inserted, or a completely different shaped cutter may be inserted. There are many other arrangements of blades within a cutter assembly that are possible and the geometry of the blades will determine the geometry of the segments produced by our invention. However, in every instance, it is still possible to produce a plurality of segments, regardless of their shape, by a single pass of this invention.

Before going on to a description of FIGS. 5 and 6, it should be noted that a preferred embodiment for practicing our invention has been set forth. There are many choices of materials that may be employed to form the various elements of this invention. There is a wide range of drive motors that can be used, and the drive can be other than electrical. Should an electrical motor be used, a one-third horsepower motor is satisfactory for operating a single cutting head. Even smaller motors can be used. Base 42 could be of wood or plastic or other relatively rigid material. Conventional hardware can be used to perform the function of screws 60, 62. Members, such as guide rails 38, 40 and elements 36 as well as guide 92 should be of relatively rigid material, such as steel, although some of the newer, more reinforced plastics can be used with equal success in this area. A cover can be provided for either basket 12 or for the entire assembly. In addition, the automatic feed apparatus 44 shown more fully and discussed more fully in FIG. 1, is also of extreme importance for commercial applications. This is simply an exemplary automatic feed mechanism; many others can be used with equal facility and success by those skilled in the art to which this invention pertains. The spacing between compartments 48, 50 is determined by the speed of belt 46, the rate of feed of potatoes from bin 58 and the frequency of reciprocation for rod 24 and piston 22.

Turning next to a description of FIG. 5, apparatus for reciprocating a plurality of pistons is shown. A motor 28 is connected, as discussed earlier, to rod 200 and mounted at opposed ends of rod 200 are pistons 202, 204. As piston 204 is driven to the right by means of rod 200 moving to the right, piston 202 also is moved to the right and a potato 206 can be placed in a basket (not shown for simplicity in FIG. 5, but similar to basket 12 of FIG. 1). Potato 208 meanwhile is being cut. Thus, as one potato is being cut, a second potato can be loaded into position for subsequent cutting and the drive force still only comes from a single motor. Automatic feed apparatus can be provided for each of the baskets (not shown) for receiving potatoes 206, 208.

With reference to FIG. 6, still another embodiment is shown for actually slicing a plurality of potatoes simultaneously. In FIG. 6, a motor 28 drives a single rod 300 having a forklike arrangement 302, 304 disposed at its left end. Connected to fork 302 is a piston 306 and connected to fork 304 is a piston 308. Pistons 306, 308 can slice potatoes 310, 312 simultaneously. It is possible to extend the the forklike arrangement so as to include two elements 302, 304 mounted on a common rod 300. A similar arrangement could also be inserted on the opposite end of rod 300. The number of potatoes that can be cut simultaneously is primarily a function of the power available from motor 28 as well as the availability of extra work stations, etc.

While the invention has been shown with reference to preferred embodiments thereof, it should be apparent to those skilled in the art to which the invention pertains that the foregoing and other changes in form, shape and details, as well as materials, may also be made without departing from the spirit and scope of our invention.

We claim:

1. Apparatus for slicing solid elements comprising in combination:

basket means for receiving and supporting said solid elements, said basket means having at least three planar surfaces, each of said surfaces being generally perpendicular to another said surface and one of said planar surfaces being a bottom planar surface, said bottom planar surface having a plurality of rails affixed thereto, each of said rails having an outer surface formed of a low friction material;

cutting means joined at one end of said basket means and being generally perpendicular to each of said planar surfaces;

clamp means fitted over said cutting means and at least two of said planar surfaces, thereby clamping said cutting means into said basket means, and said clamp means having an elevated crown for facilitating insertion and removal of said cutting means;

forcing means for forcing one said solid element through said cutting means thereby cutting said solid element into a plurality of shaped segments;

drive means for reciprocating said forcing means, said drive means comprising a motor having a rotating shaft, a rigid member affixed at one end to said shaft and having a perpendicular extension at the other end, a generally rectangular element for engaging said perpendicular extension and being driven by said perpendicular extension, means connected to said forcing means and said rectangular element for being driven in a lateral direction by said rectangular element, thereby imparting a lateral force and motion to said forcing means; and

base means for supporting said basket means and said drive means, said base means having rails in an upper surface for constraining the movement of said rectangular element in said drive means, and said base means having an affixed member for engaging, and constraining the motion of, said means connected to said forcing means and said rectangular element; and means for joining said basket means and said drive means to said base means, said means for joining said basket means to said base means comprising a removable connector, thereby enabling said basket means to be removed for maintenance.

2. Apparatus for slicing solid elements comprising in combination:

stationary basket means for receiving and supporting said solid elements, said basket means having at least three planar surfaces, each of said surfaces being generally perpendicular to another said surface;

cutting means joined at one end of said basket means and being generally perpendicular to each of said planar surfaces, said cutting means comprising a generally rectangular frame member, at least one horizontal member and at least one vertical member, said horizontal and vertical members being rigidly fixed in said frame member so as to form a grid of cutting elements;

forcing means for forcing one said solid element through said cutting means thereby cutting said solid element into a plurality of shaped segments, said forcing means comprising a piston and rod assembly, said piston having a generally rectangular cross section complementary to said cutting means frame member and said forcing means further including a resilient cap member fitted over said piston, thereby facilitating cleaning of said forcing means; and

drive means for reciprocating said forcing means; base means for supporting said basket means and said drive means; and means for joining said basket means and said drive means to said base means.

3. Apparatus of the type set forth in claim 2 wherein said resilient cap member has a plurality of extensions on the outer surface of said cap member, said extensions forming a matrix similar in geometry to said grid of cutting elements, thereby allowing said extensions to guide said solid element through said cutting elements.