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European Patent Office
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(11)

EP 1 570 961 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

07.09.2005 Bulletin 2005/36

(51) Int Cl.7: **B26D 7/18, B26D 3/26**

(21) Application number: **04447052.4**

(22) Date of filing: **03.03.2004**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR**

Designated Extension States:

AL LT LV MK

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Remarks:

Claims 11 to 18 are deemed to be abandoned due to non-payment of the claims fees (Rule 31 (2) EPC).

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(54) **Method and apparatus for slicing articles such as vegetables and fruit**

(57) The invention relates to a slicing device (1) for slicing at least one article in one slicing operation comprising a pushing frame (2) that is connected to a support frame (3), whereby said pushing frame (2) comprises two vertically extending guiding bars (4) which are suitable for attaching an article pushing member (7) and which are connectable to a first driving unit (5), said first driving unit (5) being suitable for driving the article pushing member (7) in a vertical direction (23) up and downwards along said guiding bars (4), and whereby said support frame (3) comprises a horizontally extending

frame that is connected with the guiding bars (4) of the pushing frame (2) and suitable for receiving a cutting blade unit (8) having two cutting blade frames (15, 16) in a horizontal plane, said support frame (3) being connectable to a second driving unit (6) for driving the cutting blade frames (15, 16) of the cutting blade unit (8) in a horizontal direction (24) back and forwards in said support frame (3). The invention further is related to a method for slicing an article using the device according to the present invention.

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Description

Field of the invention

[0001] The invention relates to an apparatus and a method for slicing articles, such as vegetables and fruit. More in particular, the present invention relates to an apparatus and a method for slicing a great number of different types of vegetables and fruit, including soft as well as hard fruits and vegetables, which can be cut according to the present invention in different types of configurations.

Background of the invention

[0002] Several devices and methods for cutting or slicing fruits and vegetables are well known in the art. For instance, US patent No 3,948,132 describes an apparatus for slicing fruit and vegetables such as potatoes, carrots and onions as well as tomatoes, hard boiled eggs and the like. A set of parallel cutting blades is positioned into a horizontal plane provided with a frame member for initially receiving the article to be cut. Further an article engaging member is provided for engaging and enforcing said article through the cutting blades.

[0003] US patent No 4,184,397 describes an apparatus comprising a substantial vertical hollow triangular enclosure frame having a substantially wedged-shaped interior space bounded by three sides as a pushing unit. During cutting operation, the pusher is moved towards the cutting plane.

[0004] GB 600,131 discloses an old technique and device for slicing and chipping hard vegetables, such as potatoes, carrots or the like tubers. The vegetables are pushed perpendicularly through a bed of fixed cutting blades. The device comprises a cutter frame provided with fixed cutting wires or blades supporting the vegetable, and a pusher element that pushes the vegetable through the cutter frame. Using this particular device a central portion of vegetables can be sliced into thin slices, while the more irregular ends of the vegetable are cut into larger and thicker pieces. Although this old cutting technique allows obtaining uniform slices of an article, is not suitable for cutting vegetables with a soft texture. As the cutting frame consists of fixed cutting wire or blades, a considerable pushing force is necessary to push the vegetables through this cutting frame. In the particular case of slicing of soft fruits or vegetables, this pushing mechanism would result in squashing rather than slicing.

[0005] Various other devices are available for slicing soft fruit and vegetables by utilizing a pusher with spaced fingers for pushing the fruit or vegetable at an angle along between a rack of sharp parallel spaced blades. Several of these devices are known being enhanced by holding the blades as rigidly as possible, making them simple, free acting and dependable.

[0006] The problem of all above-mentioned slicing ap-

paratuses, however, is that cutting blades in the apparatuses tend to quickly deteriorate and/or become blunt. Another problem is that slicing apparatuses are generally specifically designed for the slicing of a specific type of vegetable or fruit, e.g. only soft or only hard fruit and/or vegetables. Moreover, long-lasting handling procedures before final collection of the desired sliced articles may result in a lack of (hygienical) quality of the sliced articles.

[0007] Therefore, the main object of the present invention is to provide improvements to the known apparatuses and methods. It is in particular an object of the present invention to provide a slicing apparatus and method which can be applied for all types of fruit and/or vegetables, including soft as well as hard fruits and vegetables. It is another object of the present invention to provide a slicing apparatus and method which permits to slice all types of fruit and/or vegetables in different types of configurations. It is yet another object of the present invention to provide a slicing apparatus and method in which the operation of the cutting blades is improved. Another object of the present invention consists of providing a slicing apparatus and method in which the operation of the pushing member is improved. It is also an object of the present invention to provide further improvements to the known apparatuses and methods such that the sliced articles are neatly and hygienically sliced and packaged.

Summary

[0008] In a first aspect the invention aims to provide a slicing apparatus which is suitable for slicing soft as well as hard fruit and/or vegetables. For that, the present invention provides in a first embodiment a slicing device for slicing at least one article in one slicing operation comprising a pushing frame that is connected to a support frame, whereby said pushing frame comprises two vertically extending guiding bars which are suitable for attaching an article pushing member and which are connectable to a first driving unit, said first driving unit being capable of driving the article pushing member in a vertical direction up and downwards along said guiding bars, and whereby said support frame comprises a horizontally extending frame that is connected with the guiding bars of the pushing frame and suitable for receiving in a horizontal plane a cutting blade unit having two cutting blade frames, said support frame being connectable to a second driving unit for driving the cutting blade frames of the cutting blade unit in a horizontal direction back and forwards in said support frame.

[0009] The present invention provides a universal slicing apparatus to which different types of cutting blade units and optionally different types of article pushing members can be connected. Depending on the applied cutting blade unit and article pushing member any type of soft as well as hard fruit or vegetables can be sliced with the present slicing device. Also depending

on the applied cutting blade unit and article pushing member fruits and vegetables can be cut according to the present invention in different types of configurations. The use of a universal device for the slicing different types of fruits and vegetables greatly reduces production costs. Furthermore, the present invention provides a slicing apparatus in which the operation of the cutting blade unit is greatly improved.

[0010] One of the major improvements of the present device is that the device is suitable for rapidly and easily mounting a cutting blade unit, and in particular the cutting blade frames of the cutting blade unit. For that purpose, the cutting blade frames are provided with means for freely coupling the cutting blade frames of the cutting unit to the second driving unit. The term "*freely coupling*" as used herein refers to coupling without the use of coupling elements such as bolts and nuts or the like. Such type of coupling allows quick and easy removal of the cutting blade frames, for instance for cleaning, reparation or sharpening of the cutting blades, mounted onto the cutting blade frames.

[0011] In addition, in a preferred embodiment, the means for freely coupling the cutting blade frames to the second driving unit comprise a couple of rings which are suitable for receiving the rotating rod of the second driving unit. Preferably, said couple of rings is provided on one extremity of the cutting blade frames. In particular the cutting blade unit is driven through the couple of rings positioned on the extremity of the cutting blade frames and in which the rotating rod of the driving motor easily fits. This embodiment allows to greatly facilitate the driving mechanism of the cutting blade unit: the cutting blade frames of the cutting blade unit are driven through a single point of impact which is externally located and thus easily accessible. The relatively simple construction of the driving mechanism of the cutting frames enables to facilitate the construction of the slicing device. In particular, the place taken in by the cutting section in the slicing device can be reduced and a more compact slicing device can be constructed. The application of an easy driving mechanism in the device also permits to keep repair costs low, to improve life-time of the slicing device and to work accurately, while the cutting blade frames are free and easily accessible, e.g. for maintenance work.

[0012] In another embodiment, the invention provides a slicing device for slicing at least one article in one slicing operation comprising a pushing frame that is connected to a support frame, whereby said pushing frame comprises two vertically extending guiding bars which are suitable for attaching an article pushing member and which are connectable to a first driving unit, said first driving unit being capable of driving the article pushing member in a vertical direction up and downwards along said guiding bars, and whereby said support frame comprises a horizontally extending frame that is connected with the guiding bars of the pushing frame and suitable for receiving a cutting blade unit which is substantially

formed by a template comprising a number of holes provided with a plurality of radially disposed cutting blades.

[0013] In a further embodiment the present invention provides a slicing apparatus in which the operation of the article pushing member is greatly improved. In a preferred embodiment, the guiding bars of the pushing frame are provided with guiding means for connecting the article pushing member to the first driving unit and for moving the article pushing member in a vertical direction up and downwards along said guiding bars and along the guiding means. In particular, the guiding bars are provided with a chain drive mechanism and connection elements, connected thereto. Preferably each guiding bar is provided with a chain drive mechanism such that a defect in one of the guiding bars can easily and securely be taken over by the chain drive mechanism of the second guiding bar. Through this mechanism the article pushing member is directly driven by the first driving unit. The use of a pneumatic cylinder for driving the article pushing member is not required anymore.

[0014] In yet another embodiment, the invention provides a slicing device for slicing at least one article in one slicing operation comprising a pushing frame that is connected to a support frame whereby said pushing frame comprises two vertically extending guiding bars which are suitable for attaching a cutting blade unit and which are connectable to a first driving unit said first driving unit being capable of driving the cutting blade unit in a vertical direction up and downwards along said guiding bars, and whereby said support frame comprises a horizontally extending frame that is connected with the guiding bars of the pushing frame. The slicing device comprises a cutting blade unit comprising a cutting blade frame having at least one cutting blade. The present slicing device is not only suitable for slicing an article but also for removal of the core from a vegetable comprising. For that purpose, the cutting blade unit is, in another preferred embodiment, further provided with a displacement body which is movably mounted on said unit and which is able to be engaged in said article so as to push the periphery of said vegetable aside making the core accessible. In another preferred embodiment, the cutting blade unit is further provided with a core removal body which is movably mounted on said cutting blade unit and which is able to be engaged in said article so as to excise and remove the core of the article. In a further preferred embodiment, the present invention provides a slicing apparatus in which the operation of the cutting blade unit is greatly improved. Therefore, in a preferred embodiment, the guiding bars of the pushing frame are provided with guiding means for connecting the cutting blade unit to the first driving unit and for moving the cutting blade unit in a vertical direction up and downwards along said guiding bars and along the guiding means. In particular, the guiding bars are provided with a chain drive mechanism and connection elements, connected thereto. Preferably each guiding bar is provided with a chain drive mechanism such that a defect

in one of the guiding bars can easily and securely be taken over by the chain drive mechanism of the second guiding bar. Through this mechanism the cutting blade unit is directly driven by the first driving unit.

[0015] In yet another embodiment, the present invention provides a slicing apparatus wherein the sliced articles are immediately collected and packed after having been sliced. For that purpose, the slicing device according to the invention further comprises collection means positioned underneath the support frame for simultaneously collecting and packing the sliced articles. An advantage is that the slicing process and the packaging process can be performed a single operational step: the slices are immediately packed upon slicing, which ensures hygienical handling and which is cost as well as time-effective. Practically, the sliced articles are collected immediately upon leaving the cutting section of the slicing device into collection means, and can be immediately packed and wrapped manually or automatically into these collection means. The sliced articles need not to be transported to further packing units or the like for being packed and wrapped.

[0016] In another embodiment the present invention relates to a method for slicing an article comprising the steps of a) slicing the article into a number of slices and b) collecting and packing the sliced articles in a single operational step.

[0017] In another embodiment, the present invention further relates to the use of the device according to the invention for slicing an article.

[0018] Further advantages and improvements of the present slicing device and the method according to the invention are elucidated in the following detailed description and will be further explained in detail with reference to the accompanying drawings.

Detailed description of the figures

[0019]

FIG. 1 and **2** are schematic overviews of preferred embodiments of a device 1 according to the invention.

FIG. 3A and **3B** represent an embodiment of an exchangeable cutting blade unit comprising an upper (**FIG. 3A**) and a lower (**FIG. 3B**) cutting blade frame for use in a slicing device according to the present invention.

FIG. 4 represent another embodiment of an exchangeable cutting blade unit comprising a template having a number of holes provided with a plurality of radially disposed cutting blades for use in a device according to the present invention.

FIG. 5 illustrates a preferred embodiment of a pushing frame according to the invention.

FIG. 6 illustrates a preferred embodiment of an exchangeable cutting blade unit suitable for slicing vegetables such as salads and the like, mounted on

the pushing frame for use in a device according to the present invention.

FIG. 7A and **7B** represent embodiments of an article pushing member for use in a slicing device according to the present invention.

FIG. 8 illustrates an embodiment of a support member for use in a slicing device according to the present invention.

FIG. 9 is a schematic overview of a preferred embodiment of a device according to the invention.

Detailed description of the invention

[0020] The present invention relates to a slicing device for slicing one or more articles in one slicing operation. **FIG. 1** and **FIG. 2** depict a slicing device 1 for slicing an article in one slicing operation, said device 1 comprising a pushing frame 2 and a support frame 3. The pushing frame 2 is connected to the support frame 3 and comprises two vertically extending guiding bars 4 which are suitable for attaching an article pushing member 7. The guiding bars 4 are connected to a first driving unit 5. This driving unit 5 is suitable for driving the article pushing member 7 in a vertical direction, indicated with arrow 23, up and downwards along the guiding bars 4. The support frame 3 of the slicing device can be provided on a movable carriage 25.

[0021] The support frame 3 comprises a horizontally extending frame that is connected with the guiding bars 4 of the pushing frame 2. The frame 3 is suitable for receiving a cutting blade unit 8 and to be connected to a second driving unit 6. Preferably the cutting blade unit comprises two cutting blade frames 15, 16 which comprise a plurality of horizontally disposed cutting blades (not shown), whereby said frames 15, 16 are movable in a horizontal direction 24 in the slicing device. For driving the cutting blades, the cutting blade frames are freely coupled to the second driving unit 6. In particular, each frame is preferably provided with apertures for receiving for rotating shaft of the driving unit 6. The cutting blade unit 8 can be engaged in a horizontal plane in the support frame, as illustrated on **FIG. 1** and **FIG. 2** and connected to the driving unit 6, which enables to drive the cutting blade frames 15, 16 in a horizontal direction, indicated with arrow 24, back and forwards in the support frame 3.

[0022] It is self evident that different types of cutting blade units can be applied in the present slicing device. Depending on the applied cutting blade unit any type of soft as well as hard fruit or vegetables can be sliced with the present slicing device in a desired slicing configuration, such as slices, quarters, etc...

[0023] In one embodiment, as illustrated on **FIG. 1** and **FIG. 3**, the cutting blade unit consists of two cutting blade frames 15, 16 that are movable in a horizontal direction. Such type of cutting blade unit 8 is for instance particularly suitable for slicing an article in a plurality of slices. Cutting blades (not shown) may be horizontally

disposed on the frames 15, 16. The cutting blades of the upper support 15 preferably have a moving direction that is equal to the moving direction of the cutting blades of the under support 16. The cutting blades are positioned in an interlocking parallel way and are supported by the two above-mentioned cutting blade frames 15, 16. Both frames 15, 16 are able to slide in a horizontal plane, in a same horizontal direction. The cutting blades of the first cutting blade frame 15 lay besides the cutting blades of the second cutting blade frame 16. Thus, the cutting direction is comprised in this horizontal plane and the cutting movement goes backwards and forward over a small distance in a horizontal direction. Movement of the cutting blades is driven by the second motor unit 6. In addition, the thickness and edginess of the cutting blades may be adapted to the texture and skin characteristics of the articles to be sliced.

[0024] A detailed view of the cutting blade frames 15, 16 is provided in **FIG. 3A** and **FIG. 3B**. In a preferred embodiment, the cutting blade unit 8 is provided with means 9 for freely coupling the cutting blade frames 15, 16 to the second driving unit 6, i.e. coupling without the use of coupling elements such as bolts, nuts or the like. Said means preferably comprise a couple of rings 9 which are suitable for receiving the rotating rod of the second driving unit 6. The rings 9 are preferably provided at one extremity of the cutting blade frames 15, 16. In a particularly preferred embodiment, the rod of the second driving unit 6, which fits into these rings 9, is provided with two eccentrics.

[0025] Referring to **FIG. 2** and **FIG. 4**, another type of cutting blade unit 8 is illustrated. The cutting blade unit 8 is substantially formed by a template 13 comprising a number of holes 14 provided with a plurality of radially disposed cutting blades 17. The holes may further be provided with a wedging pin 27. Such type of cutting blade unit 8 is for instance particularly suitable for slicing an article in a plurality of quarters. The wedging pin 27 permits to keep the articles to be sliced in the center of each hole in the template. This is important in order to obtain equally sliced article parts and in order to symmetrically position the sliced articles in the collection means.

[0026] Another type of cutting blade unit 8, that has been mounted on the pushing frame 2 is illustrated in **FIG. 6**. Such cutting blade unit is particularly suitable for slicing vegetables such as salads and the like, and can be mounted on the pushing frame 2 for use in a device 1 according to the present invention. The cutting blade unit 8 comprises a cutting blade frame 34 having at least one cutting blade 17, and preferably two or more cutting blades, depending on the desired cutting configuration of the to be sliced article. The cutting blade frame 34 is provided with grooves for receiving and releasably attaching the cutting blades.

[0027] The device 1 further comprises an article pushing member 7 for pushing the articles into the cutting blades. Different types of article pushing members 7 can

be applied, also in function of the cutting blade unit 8 used in the present device. The pushing member 7 can be fixed on a guiding plate 32 and the pushing member 7 can move vertically (arrow 23) along two guiding bars 4. The pushing member 7 consists essentially of a number of pushing elements 18 equal to the number of articles to be sliced in one operation of the device 1. These pushing elements 18 are provided with spaced apart fingers 19 in order to be able to push the articles at least partly through the cutting blades.

[0028] A detailed view of suitable embodiments of article pushing members 7 is provided in **FIG. 7A** and **FIG. 7B**. The pushing member 7 illustrated in **FIG. 1** and **FIG. 7A** consists of one pushing element 18 that is provided with spaced apart fingers 19. The article pushing member is further provided with connection elements 28, for slidably connecting the pushing member to the guiding bars 4. The pushing member 7 illustrated in **FIG. 2** and **FIG. 7B** consists of a six pushing elements 18 provided with spaced apart fingers 19. The pushing member 7 is preferably movable to adjust the spaced apart fingers through the cutting blades. In addition also every pushing element 18 of the pushing member 7 is preferably movable to adjust the spaced apart fingers through the cutting blades.

[0029] The pushing frame 2 to which the pushing member 7 is connected according to the present invention is further illustrated in **FIG. 5**. The frame 2 comprises two guiding bars 4 which are connected to a driving unit 5. The guiding bars 4 preferably consist of two hollow shafts. One extremity of the bars 4 is mounted onto the support frame 3 (not shown), the other extremity of the bars 4 are interconnected by the rotatable rod 10 of the first driving unit 5. For stability, an additional rod 29 may be provided which interconnects both guiding bars 4.

[0030] The article pushing member is slidably, and preferably releasably, mounted on these guiding bars 4. The pushing member can be moved in a vertical direction 23 up and downwards along the guiding bars 4. For that, guiding means 12, connection elements 28 and chains 37 can be provided inside the guiding bars 4, for connecting the article pushing member 7 to the first driving unit 5 and for moving the article pushing member 7 in a vertical direction 23 up and downwards along said guiding means 12. Preferably, the connection elements 28 are suitable for movably connecting the member 7 to the guiding means 12. The guiding means 12 preferably comprises a chain drive mechanism which is in connection with the rotating rod 10 of the driving motor 5. More in particular, the chain drive mechanism comprises two pairs of cogwheels 33 of which one pair is mounted on the rod 10 of the driving motor 5 and the other pair is provided at the other extremity of the bars 4, i.e. the extremity which is in connected with the support frame 3 (not shown). The rod 10 is driven by the motor of the first driving unit 5. Each of the cogwheels 33 is in connection with driving chains 37. The chains 37 are further coupled to the article pushing member 7 via connection

elements 28. The chains 37 are preferably provided inside the guiding bars 4. In particular, each side of the article pushing member 7 is connected with one chain 37, such that the pushing member 7 is driven equally at both sides by the chain drive mechanism. Equally driving of the pushing member 7 at both side permits to guide the pushing member 7 linearly up and downwards 23 along the guiding bars 4 and permits to smoothly guide the pushing member 7 towards the cutting blades 17 of the cutting blade unit 8. The member 7 can be guided towards the cutting blades 17 of the cutting unit 8 at a constant velocity, without jerks. Furthermore, slipping can be avoided and a chain drive mechanism has the additional advantage of requiring little maintenance.

[0031] The present invention further provides in another embodiment for a slicing device suitable for removing the core and for slicing vegetables such as salads and the like. The apparatus is particularly appropriate for removing the core of generally ball-shaped vegetables, which can be placed individually, inverted or core-uppermost, on a support member. The invention can be useful for removing the core of all kinds of vegetables, including but not limited to salad, cabbage, celery, turnip, marrow, etc....As used herein the term "core" of the vegetable refers to the part of the vegetable, which is not comestible or considered as such. Such parts may possess less tasty components or components having an undesired texture and are not desired from a consumer point of view. The term "periphery of a vegetable" is used herein to define the portion of said vegetable, which does not comprise the core. A major improvement of the present slicing device apparatus with regard to known apparatuses is the possibility to considerably reduce the removal of vegetable material that is desired from a consumer point of view, i.e. the periphery of the vegetable. Using the apparatus according to the present invention allows collecting a higher amount of periphery material compared to currently known devices.

[0032] Referring now to **FIG. 9** there is represented a slicing device 1 for slicing at least one article in one slicing operation comprising a pushing frame 2 that is connected to a support frame 3. The pushing frame 2 comprises two vertically extending guiding bars 4 which are suitable for attaching a cutting blade unit 8 and which are connectable to a first driving unit 5. The first driving unit 5 is capable of driving the cutting blade unit 8 in a vertical direction 23 up and downwards along said guiding bars 4. The support frame 3 comprises a horizontally extending frame that is connected with the guiding bars 4 of the pushing frame 2. A support member (not shown) can be positioned onto this frame 3. The support member at least temporarily supports the article prior to slicing.

[0033] Referring to **FIG. 6**, the pushing frame 2 of the slicing device is illustrated into more detail. The frame 2 comprises a cutting blade unit 8, that is connected to the guiding bars 4 and that can be driven in a vertical

direction 23 up and downwards along said guiding bars 4. The guiding bars 4 are provided with guiding means (not shown) for connecting the cutting blade unit 8 to the first driving unit 5 and for moving the cutting blade unit 8 in a vertical direction 23 up and downwards along said guiding means. The guiding means are preferably further provided with connection elements and chains for movably connecting the cutting blade unit to the guiding means (not shown). The cutting blade unit 8 comprises a cutting blade frame 34 having at least one cutting blade 17, and preferably two or more cutting blades, depending on the desired cutting configuration of the to be sliced article.

[0034] In a preferred embodiment, the cutting blade unit 8 is further provided with a displacement body 35 provided on the extremity of a vertically aligned rod 36, which is movably mounted on said unit 8 and which is able to be engaged in an article to be sliced. The displacement body 35 preferably comprises an upper part, which is cylindrical or polygonal, and a lower part, which is conical or pyramidal. The displacement body 35 is provided with one or more grooves for removably positioning one or more cutting blades 17, attached to the cutting blade frame 34. The grooves may be provided in the upper part or in the lower part of the displacement body 35 and are preferably provided in a certain geometrical configuration. The number of grooves in the displacement body 35 may vary in function of the number of cutting elements 17 that are positioned connected to the cutting blade frame 34 and engaged in the displacement body 35. The cutting blades 17 are preferably positioned in a geometrical position onto the cutting blade frame 34 and fit into the grooves of the displacement body 35. The displacement body 35 further permits to keep cutting blades 17 spatially separated and participates to the rigidity of the cutting elements 17. The displacement body 35 not only permits to push aside the periphery of a vegetable, e.g. salad, but also to cut the vegetable periphery in a suitable number of pieces. The cutting blades 17 will cut the vegetable in a suitable number of pieces, while the article is engaged by the displacement body 35. The number of pieces will depend on the number of blades 17 provided on the cutting blade frame 34. As such, the periphery of the article will not only be pushed aside while engaging the displacement body 35, but the article will simultaneously also be cut into pieces. The body 35 is preferably adapted to be used in accordance with different types of cutting blade frames 34 and cutting blades 17. Essentially, the type and size of the cutting blades 17 will have to be adapted to the type of vegetable, while a same displacement body can be used for different vegetables.

[0035] In another embodiment, the cutting blade unit 8 is further provided with a removal body (not shown), which can be provided on the extremity of a vertically aligned rod 36. For instance, the displacement body can be provided inside the removal body. The removal body may be movably mounted on said unit 8 and is able to

be engaged in an article to be sliced for removing the core. The removal body is preferably cylindrical, but may also have another configuration such as hexagonal, rectangular, triangular, elliptical, squared, etc ... The size of the removal body may advantageously be adapted in function of the volume of the core to be removed from the vegetable. The body is provided with a cutting element, preferably a cutting blade on one of its outer edges, in particular the edge that will be brought into contact with the vegetable. This cutting blade is preferably removably mounted on the body. Preferably, the removal body will be capable of undergoing an upwards or downwards movement, but also a rotating movement either counterclockwise or clockwise. The combination of these movements provides very efficient core excision. The speed of rotation of the removal body can be advantageously adapted to the type of vegetable of which the core is to be removed.

[0036] The displacement body permits, when engaged in the vegetable, to push the periphery of said vegetable aside such that said core becomes accessible. The removal body is then engaged in the vegetable of which the periphery has been pushed aside by the displacement body. The vegetable material that is removed by the removal body then essentially consists of core material that has become more easily accessible by the action of the displacement body. The amount of comestible and desired vegetable material that is removed together with the core is thereby considerably reduced.

[0037] In another preferred embodiment, the cutting blade unit 8 is made of a material, having a σ 0.2 tension limit which is equal to steel. The term "elasticity" refers to the ability of a material to deform under load and return to its original size and shape when the load is removed. The degree of elasticity of a material is referred to as its modulus of elasticity. A higher value of the modulus indicates a more brittle material (i.e. glass, ceramics). A very low value represents a ductile material (i.e. rubber). The term " σ 0.2 tension limit" refers to the ability of a material to reform to its normal size when a load is removed. When the tension stays below σ 0.2, the material reforms to its normal size, once above the σ 0.2 tension limit, the deformation is permanent. Examples of load include for duplex ± 480 N/mm², for inox 1.4301 ± 220 N/mm², for steel ± 400 N/mm². In a preferred embodiment, the cutting blade unit is made of stainless steel or duplex. The use of this type of material advantageously enables to minimize deformations of the cutting blade unit and the cutting blade frames which may be caused by the cutting mechanism or the tightening process of the cutting blades.

[0038] In a further embodiment the slicing device according to the present invention is further provided with a support member 20 positioned onto the support frame. The support member 20 may be positioned in between the cutting blade unit 8 and the article pushing member 7 in slicing devices as embodied in **FIG. 1** and **FIG. 2**,

or underneath the cutting blade unit 8 in a slicing device as embodied in **FIG. 9**. **FIG. 8** illustrates an embodiment of such support member 20. The member 20 at least temporarily supports the article prior to slicing. The support member 20 is provided with at least one spacing element 21 for supporting the cutting blades 17 provided on the cutting blade frames 15, 16 of the cutting blade unit 8. A spacing element 21 may be provided in the middle of the support member and affixed to the support member by means of bolts 31, as illustrated on Fig. 8. Alternatively, the extremities 30 of the support member 20 can be carried out as spacing elements. In this case a central spacing element 21 is not required in the support member and place can be gained for positioning the article to be sliced in the support member. The support member 20 is being produced in function of the dimensions of the product to slice and the number of products that have to be sliced. For example, for slicing cucumbers only one hole needs to be provided in the support 20. Then the width of the support 20 is much more important than the length. The support member 20 can be made of metal. Holes can be provided in said support for supporting the articles prior to being sliced.

[0039] In yet another preferred embodiment, the slicing device 1 is further provided with collection means positioned underneath the support frame for simultaneously collecting and packing the sliced articles. The collection means are recipients which are suitable for being further handled and transported. The collected sliced articles need not to be transferred to additional trays and can be immediately wrapped in the collection means.

[0040] As the invention is in particular useful for cutting tomatoes the following description will be directed to the cutting of tomatoes in particular to the cutting of a series of six tomatoes. Therefore, the slicing apparatus depicted in **FIG. 2** is particularly suitable. However, neither the number of articles, nor the specific kind of articles should be understood as a limitation for the invention. As already explained above the invention can be useful for cutting all kinds of articles.

[0041] In general a tomato can be cleaned, washed and the stem portion can be cut off or bored out prior to undergoing the slicing operation. For the purposes of the explanation it will be understood that a same kind of tomato having a similar dimension is used in the series to be sliced.

[0042] In a first step of a preferred embodiment of the method according to the invention the desired cutting configuration of the article is determined. It may be desired to obtain an article that has been sliced in multiple slices of equal thickness. Alternatively, it may also be desired to obtain an article that has been cut into quarters. Depending on the desired configuration an appropriate cutting blade unit and optionally an appropriate pushing member is installed onto a slicing device according to the present invention. For instance, for obtaining a plurality of slices, the cutting blade unit may consist of two cutting blade frames, which are movable in a horizontal

plane, and whereon a plurality of horizontally disposed cutting blades are provided. The pushing member may consist of a single pushing element having space apart fingers. Such configuration is illustrated in **FIG. 1**. In another example, for obtaining a plurality of quarters, the cutting blade unit may consist of a template comprising a number of holes provided with a plurality of radially disposed cutting blades. The pushing member may consist of different pushing elements equal to the number of holes in the cutting blade unit. Such configuration is illustrated in **FIG. 2**.

[0043] In a further preferred embodiment of the method according to the invention the article pushing member 7 with the respective pushing elements 18 pushes the articles through the support member 20 and through the cutting blade unit frames 15, 16, or the cutting blade unit as shown in **FIG. 4**.

[0044] The sliced article is immediately collected upon slicing in a collection tray that is suitable for further transport and dispensing. Collecting and packing the sliced articles is performed in a single operational step.

[0045] The complete operation can be done in a time span less than 10 seconds. In preferred embodiments whereby a precise control of the pushing member 7 and the cutting blade unit 8 is obtained, a slicing operation in less than five seconds can be obtained. A further automation may result in that the initial transport of the articles into the support member 20 and the further handling of the collection trays are automated.

[0046] It is clear that the efficacy of the device and the method of present invention will depend on the rapidity and sharpness of the used cutting blades. A rapid and efficient slicing of the article ensures hygienical handling.

[0047] It should be apparent that the disclosure and teachings of the present invention will include alternative designs within the scope of the present invention.

Claims

1. A slicing device (1) for slicing at least one article in one slicing operation comprising a pushing frame (2) that is connected to a support frame (3),
whereby said pushing frame (2) comprises two vertically extending guiding bars (4) which are suitable for attaching an article pushing member (7) and which are connectable to a first driving unit (5), said first driving unit (5) being capable of driving the article pushing member (7) in a vertical direction (23) up and downwards along said guiding bars (4),
and whereby said support frame (3) comprises a horizontally extending frame that is connected with the guiding bars (4) of the pushing frame (2) and suitable for receiving in a horizontal plane a cutting blade unit (8) having two cutting blade frames (15, 16), said support frame (3) being connectable to a second driving unit (6) for driving the cutting

blade frames (15, 16) of the cutting blade unit (8) in a horizontal direction (24) back and forwards in said support frame (3).

2. Slicing device according to claim 1, wherein the cutting blade unit (8) comprises two cutting blade frames (15, 16) which comprise a plurality of horizontally disposed cutting blades (17), whereby said frames (15, 16) are movable in a horizontal direction (24).
3. Slicing device according to claim 1 or 2, wherein said cutting blade frames (15, 16) are provided with means (9) for freely coupling said cutting blade frames (15, 16) to the second driving unit (6).
4. Slicing device according to claim 3, wherein said means (9) for freely coupling the cutting blade frames (15, 16) to the second driving unit (6) comprise a couple of rings (9) which are suitable for receiving the rotating rod of the second driving unit (6).
5. Slicing device according to claim 4, wherein the rod of the second driving unit (6) is provided with two eccentrics.
6. A slicing device (1) for slicing at least one article in one slicing operation comprising a pushing frame (2) that is connected to a support frame (3),
whereby said pushing frame (2) comprises two vertically extending guiding bars (4) which are suitable for attaching an article pushing member (7) and which are connectable to a first driving unit (5), said first driving unit (5) being capable of driving the article pushing member (7) in a vertical direction (23) up and downwards along said guiding bars (4),
and whereby said support frame (3) comprises a horizontally extending frame that is connected with the guiding bars (4) of the pushing frame (2) and suitable for receiving a cutting blade unit (8) which is substantially formed by a template (13) comprising a number of holes (14) provided with a plurality of radially disposed cutting blades (17).
7. Slicing device according to claim 1 or 6, wherein the guiding bars (4) are provided with guiding means (12) for connecting the article pushing member (7) to the first driving unit (5) and for moving the article pushing member (7) in a vertical direction (23) up and downwards along said guiding means (12).
8. Slicing device according to claim 1 or 6, wherein the article pushing member (7) comprises a plurality of pushing elements (18) equal to the number of sliced articles in one slicing operation, comprising spaced apart fingers (19), said pushing elements (18) are able to push an article at least partly through the

cutting blades (17).

9. Slicing device according to claim 1 or 6, further comprising a support member (20) positioned in between the cutting blade unit (8) and the article pushing member (7) for at least temporarily supporting the article prior to slicing, said support member (20) being provided with at least one spacing element (21) for supporting the cutting blades (17) in the cutting blade unit (8).

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10. A slicing device (1) for slicing at least one article in one slicing operation comprising a pushing frame (2) that is connected to a support frame (3),

whereby said pushing frame (2) comprises two vertically extending guiding bars (4) which are suitable for attaching a cutting blade unit (8) and which are connectable to a first driving unit (5), said first driving unit (5) being capable of driving the cutting blade unit (8) in a vertical direction (23) up and downwards along said guiding bars (4),

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and whereby said support frame (3) comprises a horizontally extending frame that is connected with the guiding bars (4) of the pushing frame (2).

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11. Slicing device according to claim 10, wherein the guiding bars (4) are provided with guiding means for connecting the cutting blade unit (8) to the first driving unit (5) and for moving the cutting blade unit (8) in a vertical direction (23) up and downwards along said guiding means.

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12. Slicing device according to claims 10 or 11, wherein the cutting blade unit (8) comprises a cutting blade frame (34) having at least one cutting blade (17).

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13. Slicing device according to any of claims 10 to 12, wherein cutting blade unit is further provided with a displacement body (35) which is mounted on said unit (8) and which is able to be engaged in said article.

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14. Slicing device according to any of claims 10 to 13 wherein cutting blade unit is further provided with a removal body which is mounted on said unit (8) and which is able to be engaged in said article for removing the core of said article.

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15. Slicing device according to claim 10, further comprising a support member (20) positioned onto the support frame (3) for at least temporarily supporting the article prior to slicing.

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16. Slicing device according to any of claims 1-15, wherein said cutting blade unit is made of stainless steel or duplex.

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17. Slicing device according to claim 1, 6 or 10, further

comprising collection means positioned underneath the support frame (3) for simultaneously collecting and packing the sliced articles.

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18. Slicing device according to claim 1, 6 or 10, wherein said support frame (3) is provided on a movable carriage (25).

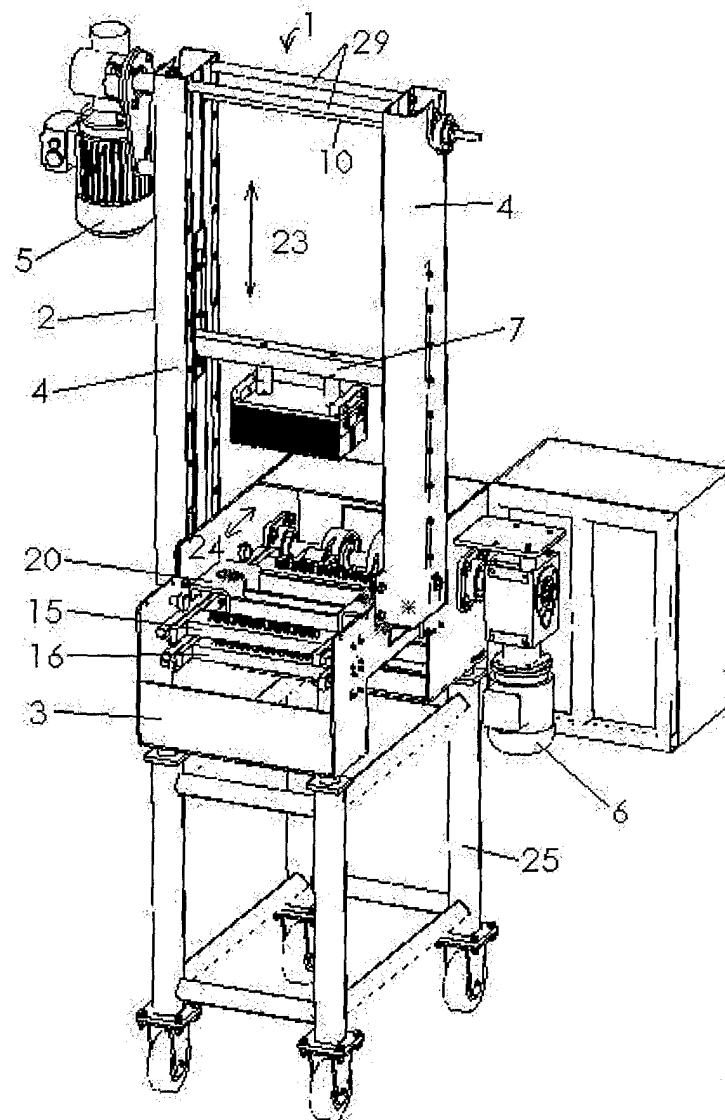


FIG. 1

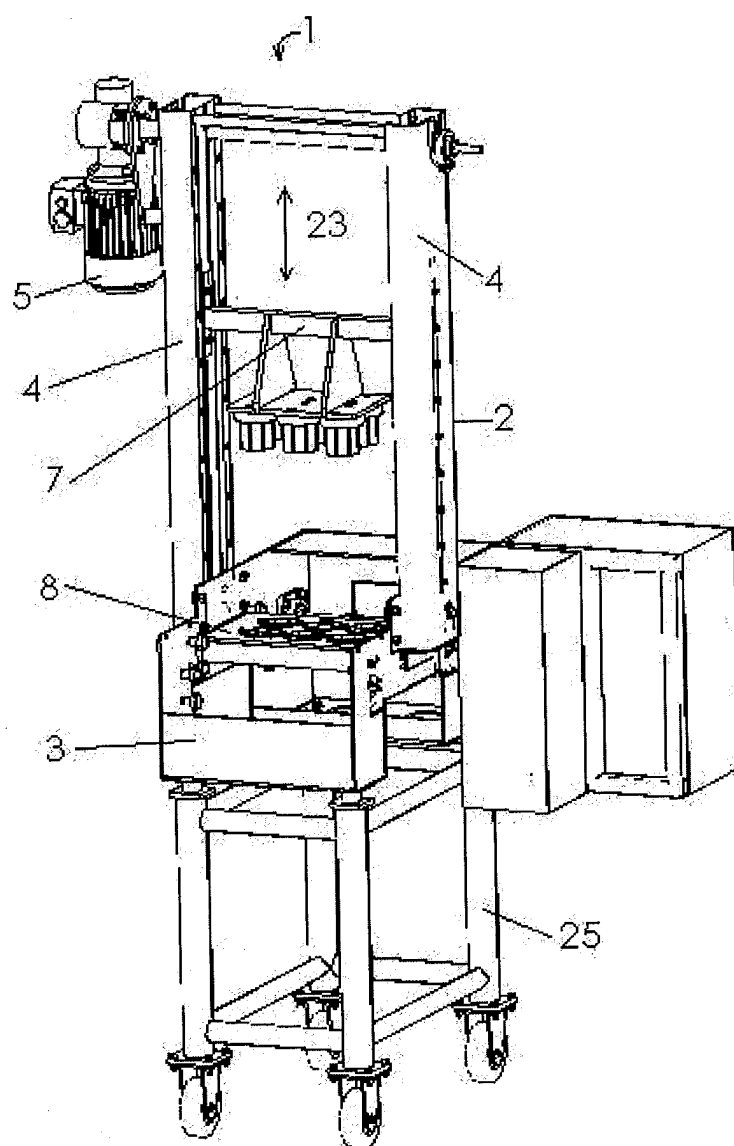


FIG. 2

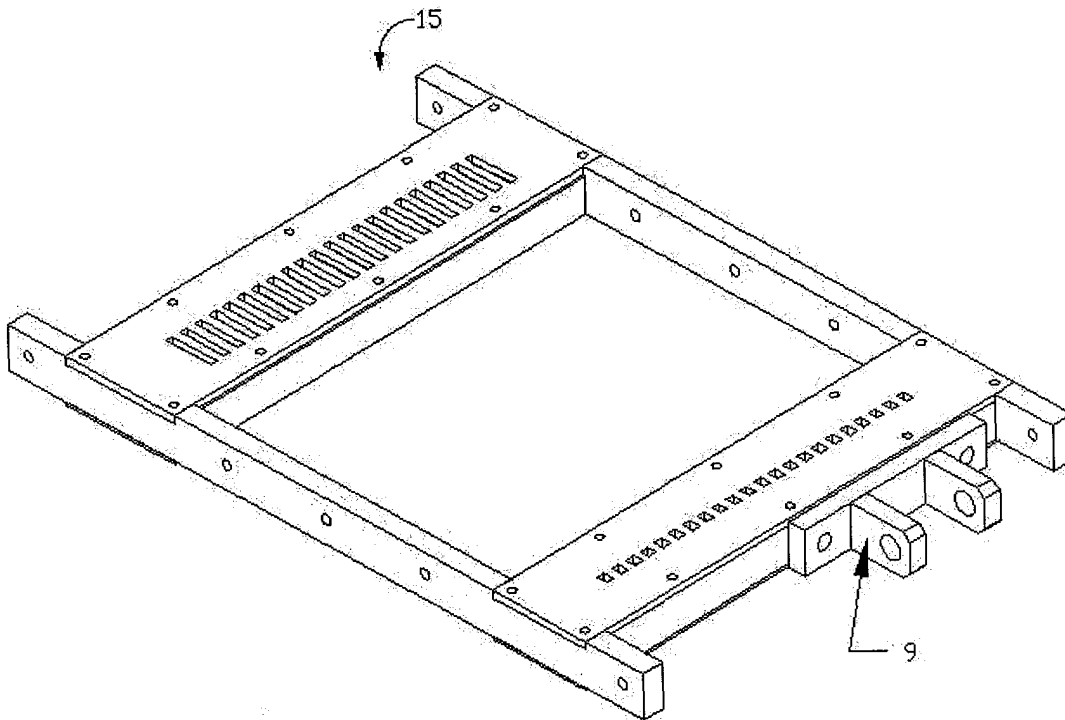


FIG. 3A

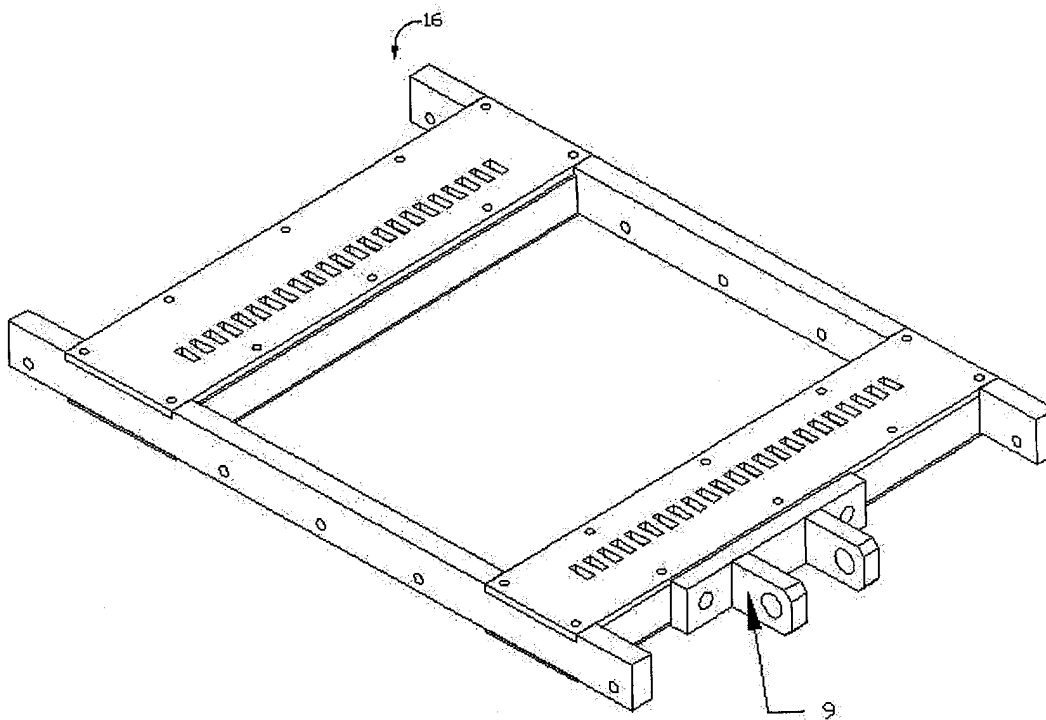


FIG. 3B

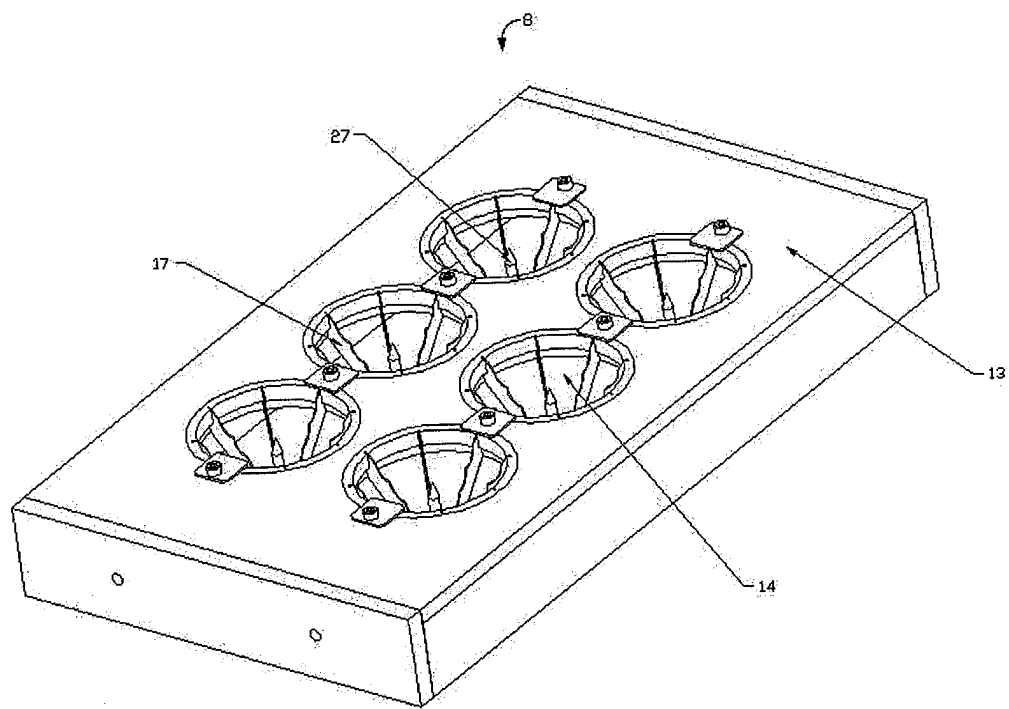


FIG. 4

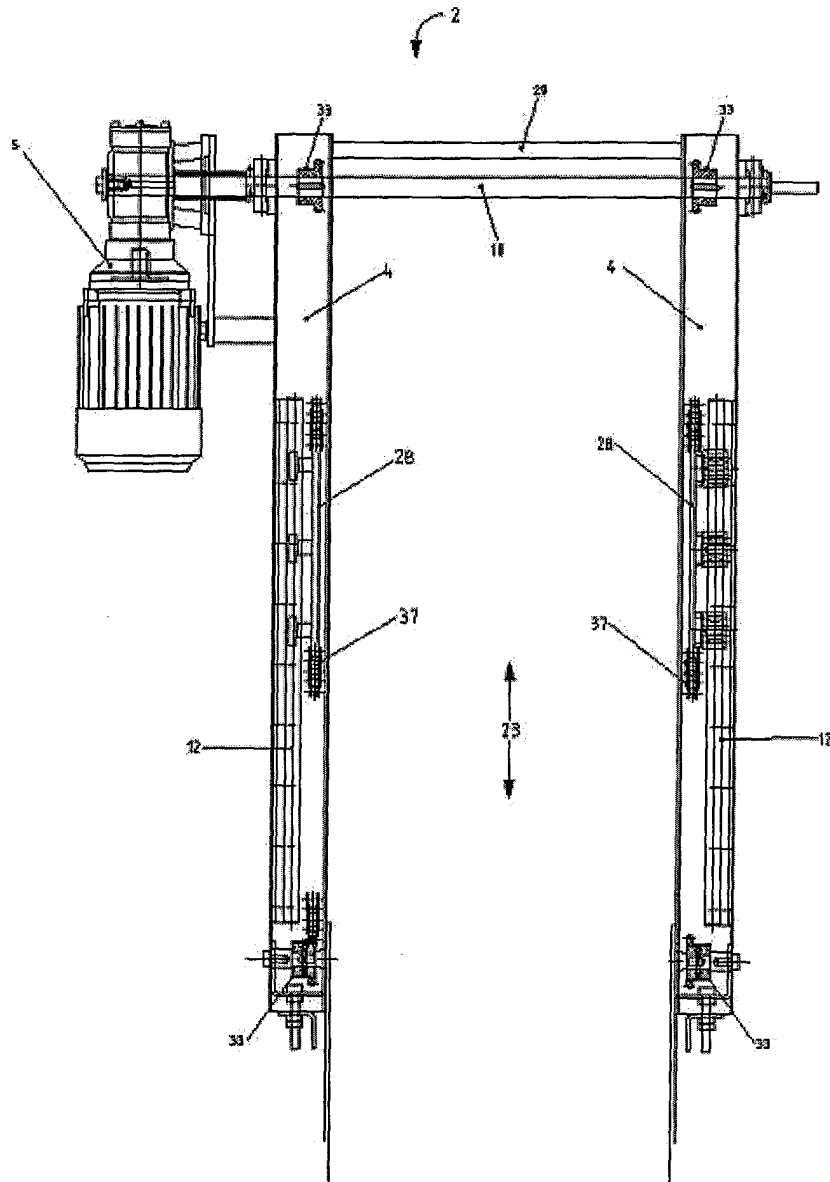


FIG. 5

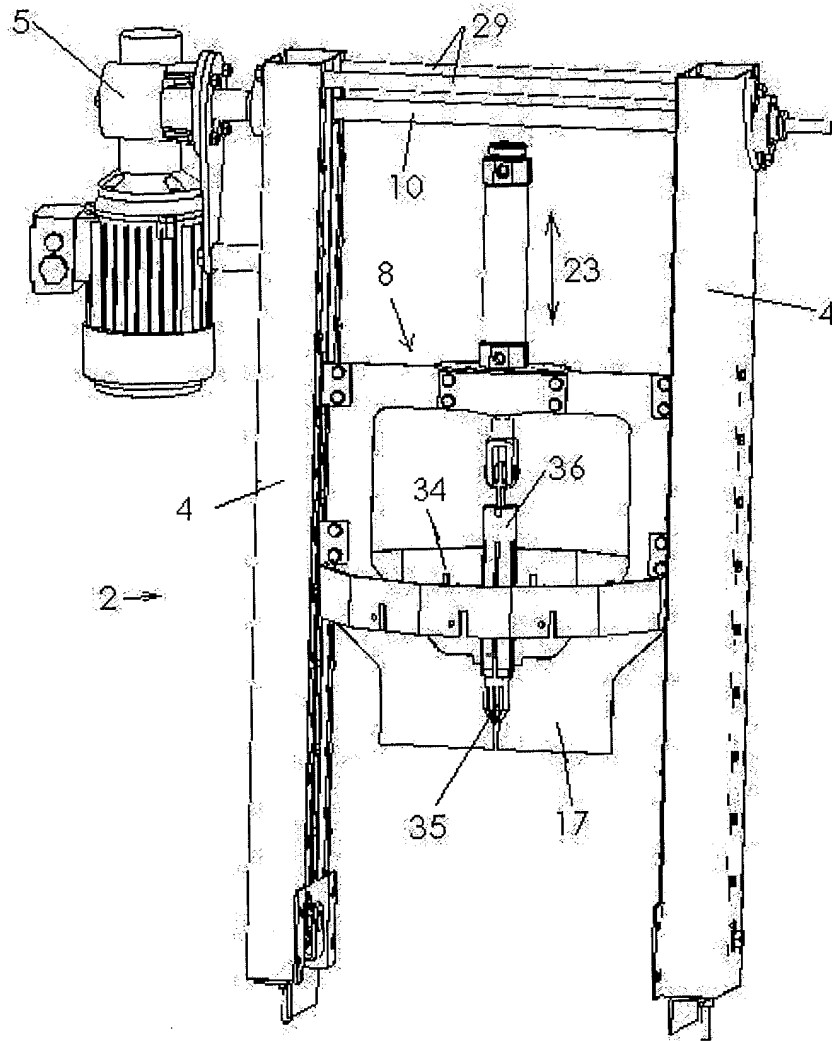


FIG. 6

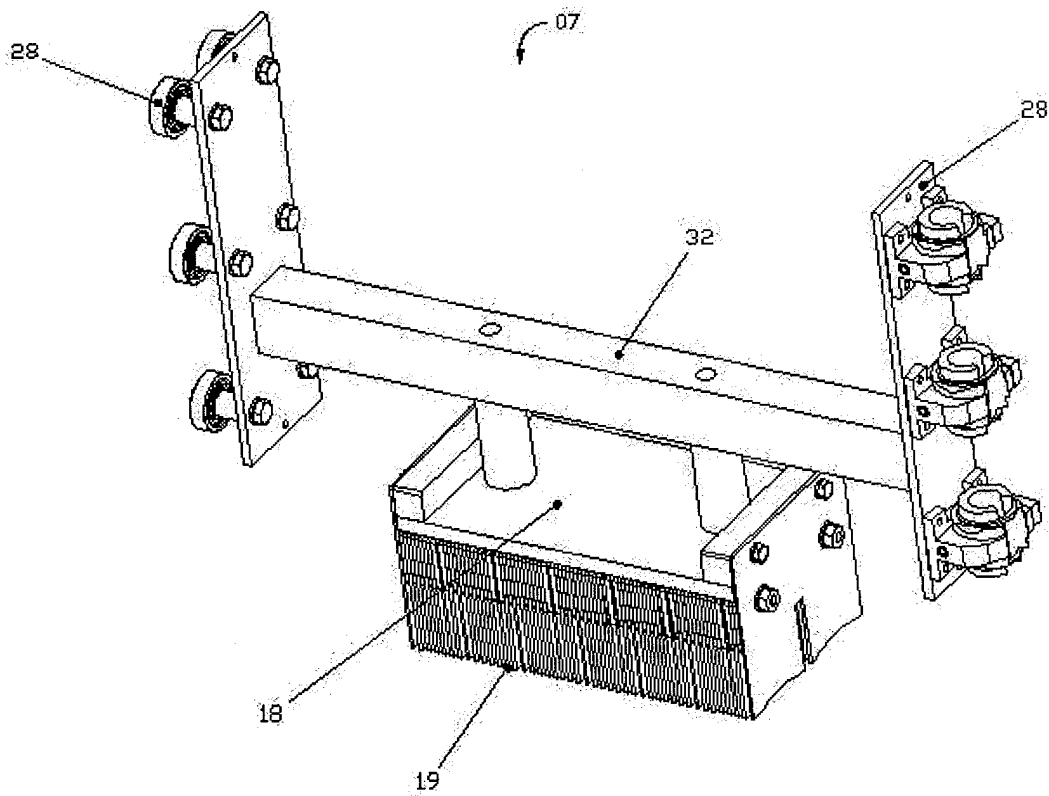


FIG. 7A

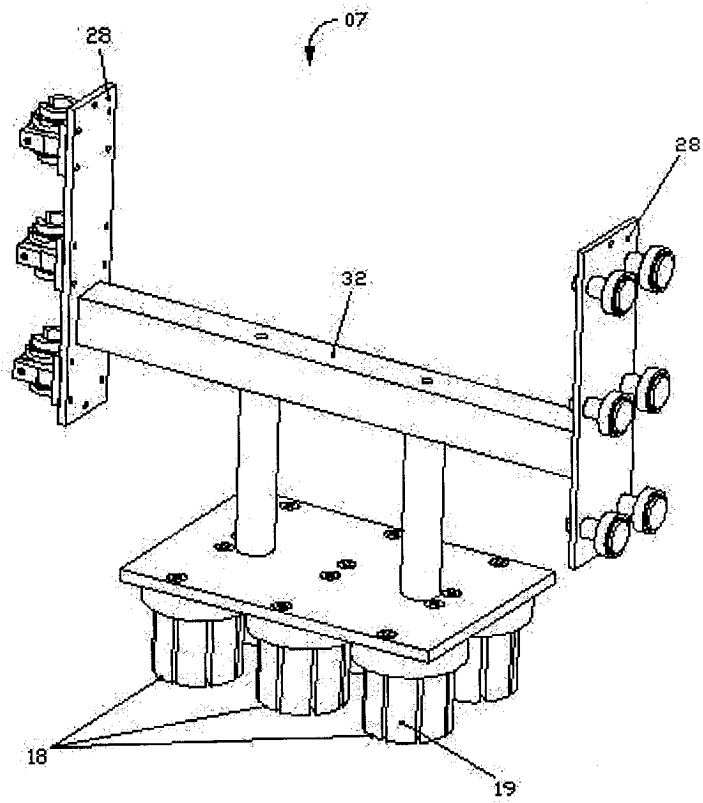


FIG. 7B

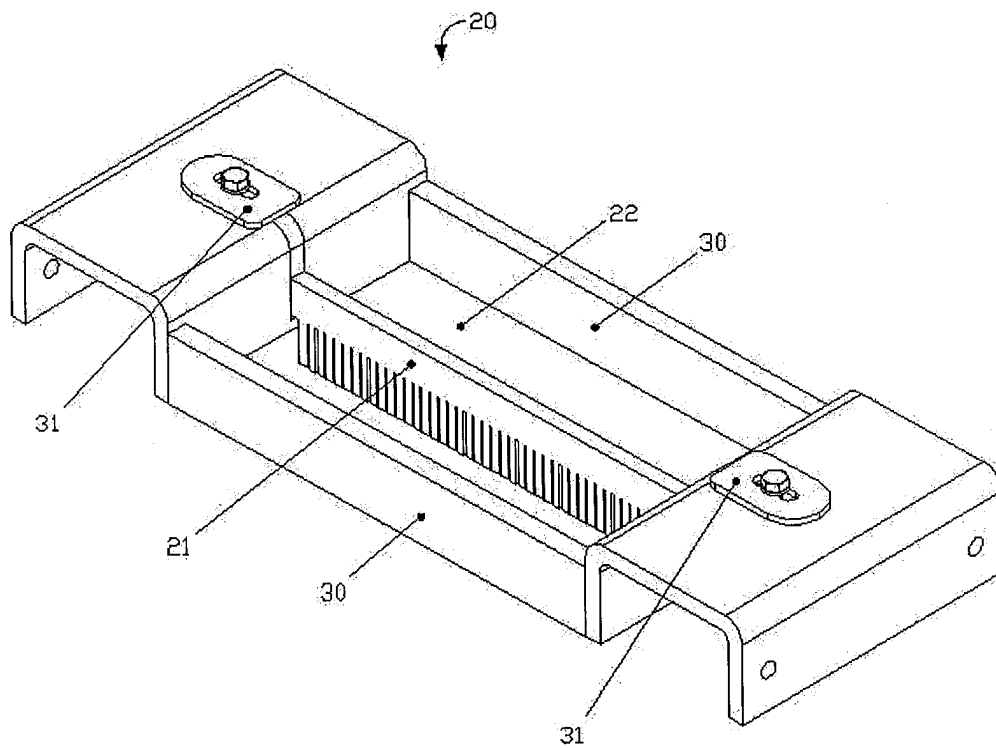


FIG. 8

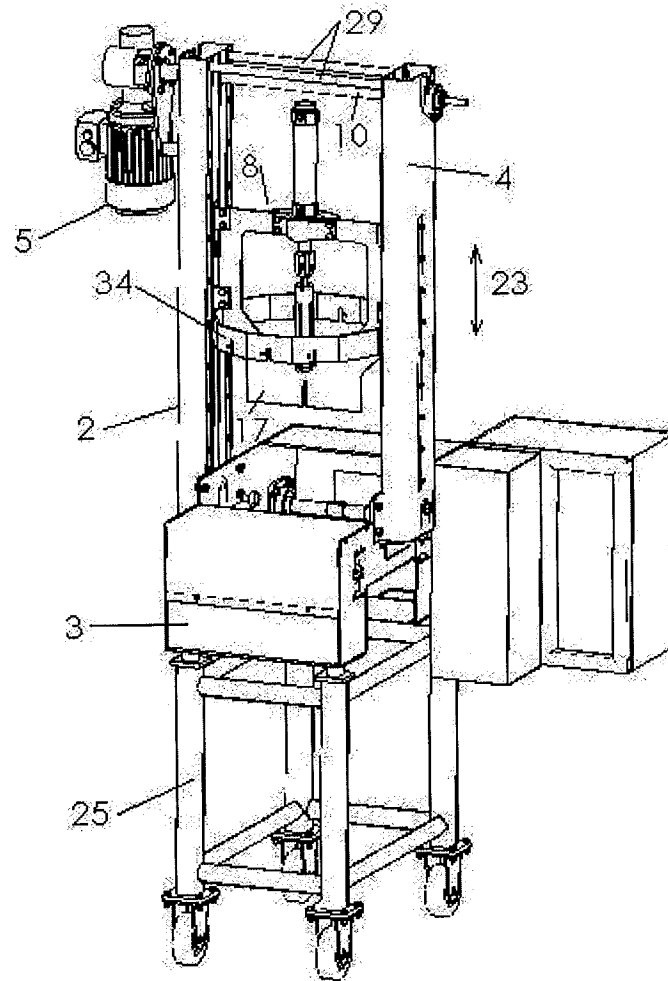


FIG. 9



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 44 7052

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 2002/170398 A1 (VERHAEGHE JOZEFF JAN) 21 November 2002 (2002-11-21) * the whole document *	1-8	B26D7/18 B26D3/26
X	WO 03/051162 A (ROSSO CARLO) 26 June 2003 (2003-06-26) * the whole document *	6	
A	US 5 125 305 A (MORRISON CLIFTON H ET AL) 30 June 1992 (1992-06-30) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B26D
<p>The present search report has been drawn up for all claims</p>			
Place of search		Date of completion of the search	Examiner
Munich		20 August 2004	Canelas, R.F.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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EPO FORM 1503 03/02 (P04001)



European Patent
Office

Application Number

EP 04 44 7052

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☒ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1--9



European Patent
Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 04 44 7052

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-5,7-9

Slicer with blades for horizontal movement

1.1. claim: 6

Slicer with a cutting blade with a particular configuration
for round fruits or vegetables

2. claim: 10

Slicer with a particular configuration of the cutter

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 44 7052

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-08-2004

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