Dec. 15, 1959 N. B. HENRY 2,917,093

POTATO SLICING MACHINE

Filed Sept. 2, 1955 3 Sheets-Sheet 1

FIG. 1

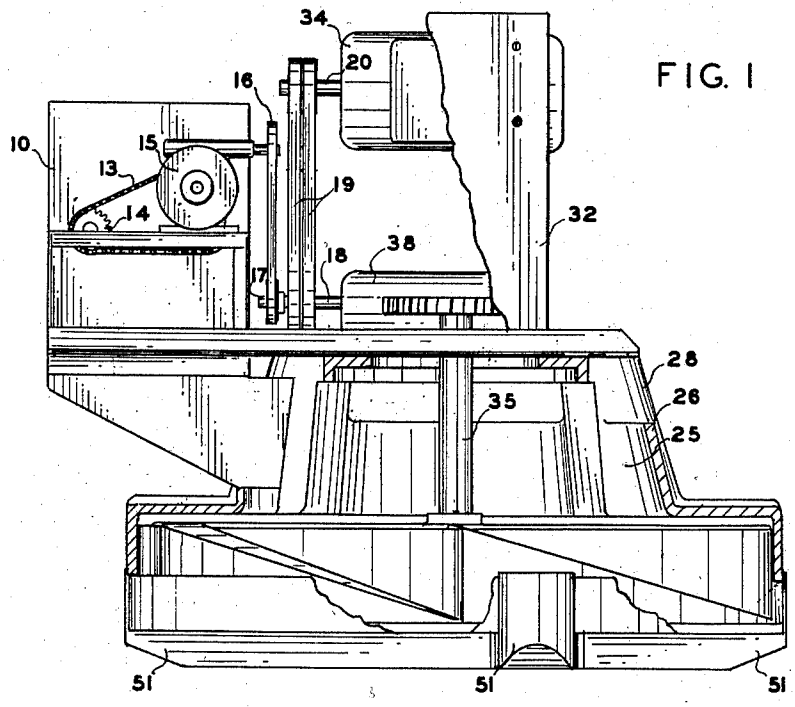

FIG. 2

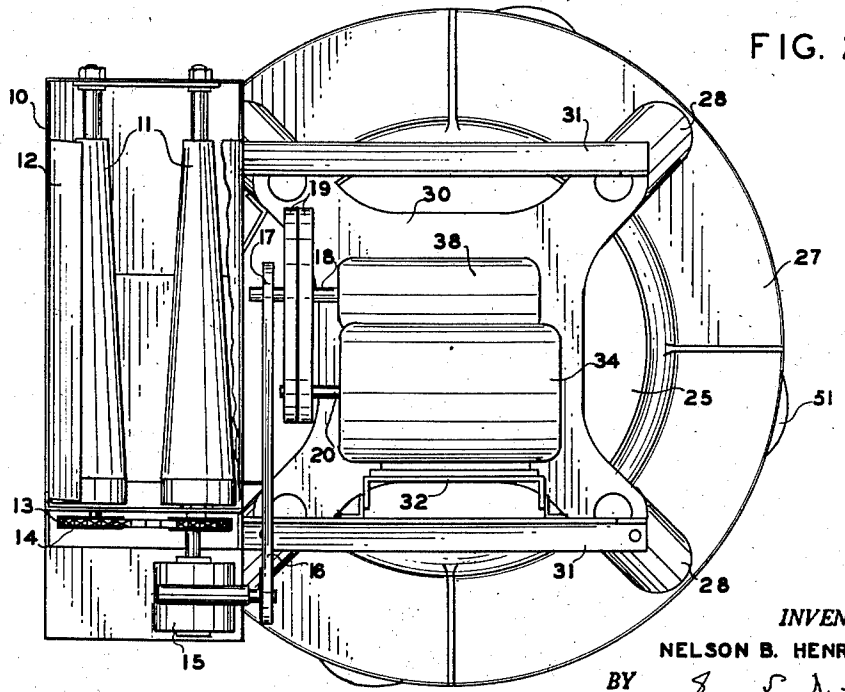

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FIG. 3

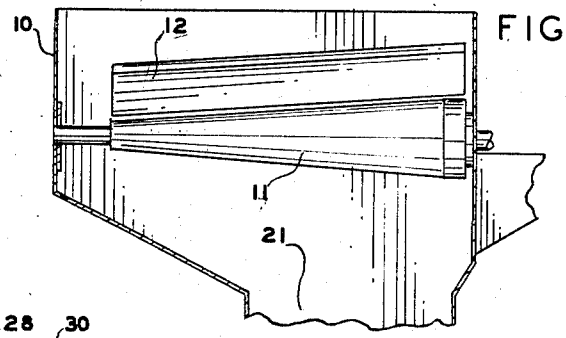

FIG. 4

FIG. 5

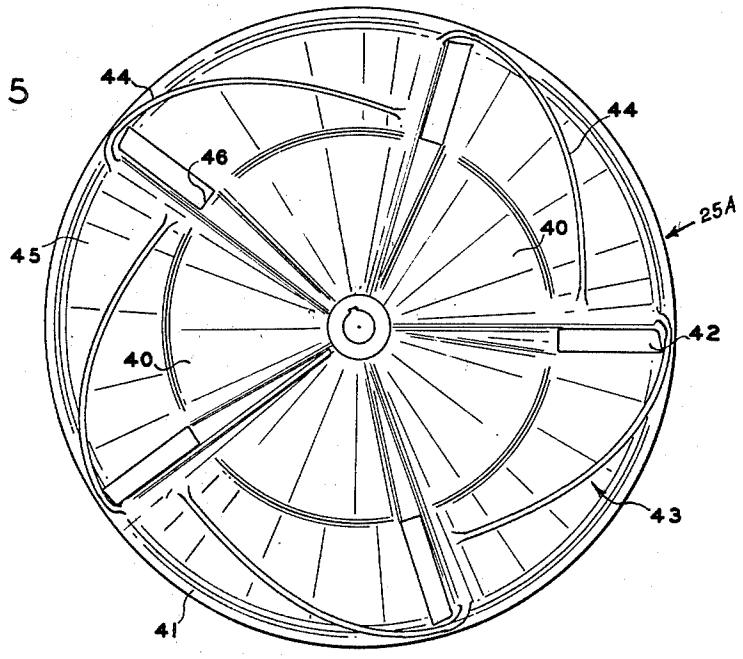

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FIG. 6

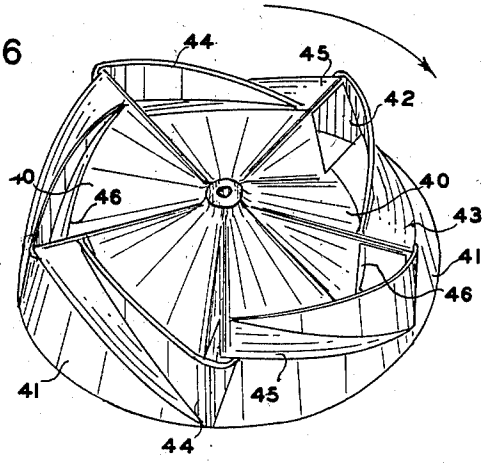


FIG. 7

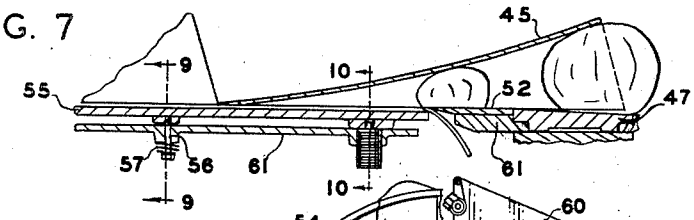
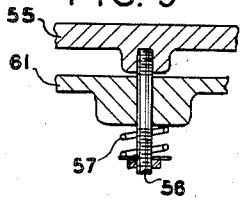


FIG. 9



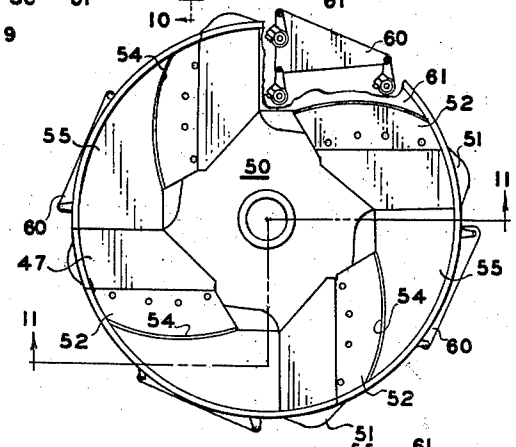


FIG. 10

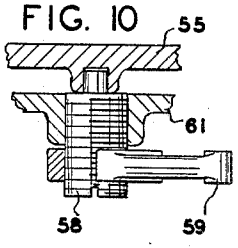
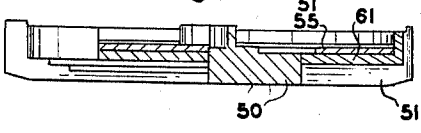


FIG. 8

FIG. 11



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United States Patent Office 2,917,093
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2,917,093

POTATO SLICING MACHINE

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Application September 2, 1955, Serial No. 532,166

11 Claims. (Cl. 146—165)

This invention relates to slicing apparatus and is particularly concerned with stationary blade apparatus for successively slicing articles which are caused to travel in a path of movement relative to such stationary blades.

While certain aspects of the present inventive concept may be broadly applicable to the slicing of various types of material, the invention as herein presented is particularly adapted for the slicing of potatoes in preparation for the treatment thereof to form potato chips. In the preparation of slices of potatoes for such subsequent cooking, certain factors are essential in order to provide for the most efficient and effective preparation of the slices. One important factor in the preparation of the slices is to provide for a uniform thickness of slice since it will be understood that if the slices vary in thickness relative to one another, the cooking time required will vary and hence a non-uniform product will result. It is also important to provide for the smooth surface slicing of the potato since, if the surface of the cut is rough and uneven, more of the starch cells are opened and since the starch forms the major portion of the finished potato chip, the fracturing of the cells produces a loss in weight which may render the operation uneconomical. Also the breaking of a great number of starch cells produces a surface starch which must be removed, preferably by washing the slices preparatory to cooking to prevent the surface starch and the water contained in the potatoes from forming a paste which would cause the slices to stick together when they are immersed in the hot fat used in the cooking process. Another important factor in the manufacture of the potato chips is the fact that the heat consumed in the boiling of the chips in the fat used is a material element of production cost. Therefore should adjustments of equipment requiring shut down be necessary, a severe loss is entailed. Inefficient and uneconomic results have also followed from attempts to successively slice articles of widely different sizes. Where large and small potatoes are indiscriminately mixed in their supply to the cutting operation, the smaller potatoes are not properly held in position for slicing and this condition continues until the larger preceding potatoes are sliced to the extent that its height is diminished such that it is less than the height of the following small potato. The result is a nicking and partial slicing of such smaller potatoes pending the time that they are properly held in slicing position. The fragmentary slices produced from the smaller potatoes during this interim are for the most part a total loss as they are unsuitable for the production of marketable chips.

It is therefore among the primary objects of the present invention to provide an improved slicing machine particularly adapted for the uniform smooth slicing of potatoes in preparation for the cooking of the slices to provide potato chips.

Another object of the present invention is to provide a slicing apparatus of the type defined in which the slices provided are of uniform thickness throughout the entire slice and wherein the thickness of one slice is uniform

with respect to other slices formed in the same operation.

Another important object of the present invention is to provide a slicing apparatus in which the sliced surface formed by the operation is smooth and wherein the disruption of starch cells of the potato is maintained at a minimum.

It is also an object of the present invention to provide an apparatus of the character described in which adjustments of apparatus particularly as to the thickness of the slice being formed may be readily made without terminating the operation of the machine and one in which when knife changes require termination of operation, such termination may be limited to a minimum interval of time.

It is also among the primary objects of the invention to provide in an apparatus of the character described means for segregating the potato as to size as each batch of potatoes is fed into the slicer.

With these and numerous other objects, features and advantages of the present invention in view, reference may be had to the following specification taken in conjunction with the accompanying drawings in which:

Fig. 1 is a side elevation partly broken away showing one preferred embodiment of the present invention.

Fig. 2 is a top plan view of that form of the invention shown in Fig. 1.

Fig. 3 is a central sectional view through the supply hopper of that form of the invention shown in Figs. 1 and 2.

Fig. 4 is a transverse section through the hopper and upper supply chamber of the present invention.

Fig. 5 is a top plan view of the rotary shell of the invention.

Fig. 6 is a reduced perspective view of the rotary shell of Fig. 5.

Fig. 7 is a reduced detail sectional view showing the presentation of the articles to the fixed cutter blades.

Fig. 8 is a top plan view of the cutting structure of the present invention.

Fig. 9 is an enlarged detail view taken on lines 9—9 of Fig. 7.

Fig. 10 is an enlarged detail sectional view taken on lines 10—10 of Fig. 7.

Fig. 11 is a sectional view taken on lines 11—11 of Fig. 8.

That form of the invention herein presented by way of illustration may be generally characterized as providing a feed hopper including means preferably in the form of parallel conical rollers by which an indiscriminate sized group of potatoes may be fed from the hopper in the order of their size. From the feed hopper, the potatoes are delivered to a supply chamber and thence to a rotary shell that distributes potatoes into arcuate downwardly inclined tunnels which receive the potatoes and pass each potato successively over the cutting edge of a plurality of fixed cutting blades so as to form successive slicing cuts on each potato delivered from the supply chamber. One of the features of the present invention is the provision of an adjustability of the conveying surface for the potatoes with respect to the fixed cutting blades so as to insure rapid accurate adjustment of the thickness of the slice. Another feature of the invention is the provision of cutting edges of arcuate form which provide for the angular slicing of the article as a means to insure a smooth cut surface thereof and a further feature is the provision of readily removable and replaceable blades insuring a minimum of down time when change thereof is necessary.

Referring to the drawings illustrating one preferred structural embodiment of the present inventive concept, the reference numeral 10 generally indicates a potato feed hopper to which potatoes may be mechanically delivered

or automatically conveyed, e.g. by bucket-type conveyors. It is important to note that in operation of the device batch feeding is contemplated in that each batch of potatoes is sliced to such as extent that the last potato of the batch is so reduced in height that it will not interfere with the small potatoes first entering from the succeeding batch. Within the hopper **10**, there is provided a pair of spaced parallel sorting rolls **11** of generally frusto-conical configuration, the wider ends being positioned at the point of delivery of the potatoes. Within the walls of the hopper, guard plates **12** are provided extending over the outer edges of the sorting rolls **11** so as to define a central diverging downwardly sloped path between the rollers through which the potatoes may be delivered. The rolls **11** are preferably driven, both in the same direction, by means of chain **13** trained over sprockets **14** on the ends of the rollers. A drive for the sprockets is provided by reduction gearing indicated at **15** which in turn is driven by belt **16** trained over pulley **17** on the shaft **18**, which shaft in turn is driven by belts **19** of a primary drive motor shaft **20**. As indicated at **21** the discharge to the hopper **10** is directly under the narrower portions of the delivery space formed between the rollers **11** and thus as the potatoes are delivered to the hopper **10**, smaller potatoes will immediately travel downwardly between the closest surfaces of the rollers **11**. Larger potatoes will be delayed in their passage between rollers due to the necessity of their moving longitudinally thereof to register with a space of sufficient breadth for their passage. Hence, while potatoes of indiscriminate size may be loaded into the hopper **10**, he arrangement is such that the potatoes will be delivered from the hopper in reverse order of their size, the smaller potato being first delivered while the larger potatoes are delayed in their passage.

From the discharge mouth **21** of the hopper **10**, the potatoes are loaded through a downwardly inclined chute **24** to a supply chamber **25** defined between the upper frusto-conical wall **26** of a stationary shield and superstructure **27**. The annular wall **26** forms an integral part of the casting **27** which includes upwardly inclined ribs **28** which support a horizontal spider **30** across which there are disposed transverse supporting bars **31** upon which the hopper **10** is mounted and which support a vertically extending supporting channel on which the primary drive motor **34** is mounted from which the power shaft **20** extends. Also mounted on the horizontal spider **30** is a reduction speed gear housing **38** driven by the shaft **18** which in turn drives a vertical shaft **35** for imparting rotation to the rotary shell hereinafter to be described.

Directly below the chamber **25** formed by the wall **26**, there is provided the rotary shell **25A** mounted for rotation with and supported by the shaft **35**. The rotary shell **25A** comprises an inverted shell having generally downwardly inclined spaced segments **40** radially bounded by the internal walls **41** extending from the mouths **42** of peripherally arranged tunnels **43**. The rotation of the shell is as indicated by the arrow in Fig. 6 and each mouth of the tunnel is preceded by an inwardly curved vertical guide plate wall **44** by which potatoes descending downwardly over the segments **40** will be guided for entry into the mouths **42** of the tunnels. In that form of the invention here shown there are five such annular tunnels, the mouths of which are generally rectangular in shape and the upper top walls **45** descend from one tunnel to the next. The inner walls **46** of the tunnels are arcuate and outwardly tapering toward the outer tunnel walls **41** and the bottom of the tunnel is open to present the potatoes entering the tunnels to the slicing mechanism. From this arrangement, it will be seen that potatoes delivered in order as to size move downwardly from the chamber **25** to which they are delivered by the chute **24** of the hopper **10** over the segments **40** to be engaged by the guides **44** and delivered to the mouths **42** of the five tunnels. Since the shell is rotated in the direction indicated, the potatoes will be scooped into the mouths of the tunnels and upper inclined wall **45** thereof will urge the potatoes downwardly and at the same time the rotation of the shell will move the potatoes in an annular path as they are being sliced until the slicing consumes the entire article.

Fixedly mounted below the rotary shell including the tunnel members, there is mounted a supporting and cutting structure comprising a central base portion **50** having radiating arms **51** to which in a parallel plane there are secured plates **61** disposed between the radiating arms **51** to complete a circular configuration. Cutters **52** are rigidly attached to a portion of upper surface of plate **61**. At the leading edge of cutter **52**, vertically adjustable platens **55** are mounted on the remaining upper surface of plate **61** in a plane parallel thereto and constitute the supporting surfaces for the potatoes. The cutters **52** are characterized by an arcuate cutting edge **54** arranged in opposed relation with respect to the rotation of the shell. The platens **55** are held down with respect to plate **61** through the action of spring **57** on stud **56**. With this arrangement it will be seen that the platen is capable of vertical motion relative to the plate **61**. To separate the platen **55** in a given spaced relation to plate **61** there is provided a plurality of adjusting screws **58**, having attached thereto an adjusting arm **59**, said arms **59** being interconnected by adjusting link **60**. This arrangement is such that as the adjusting link **60** is moved, the arms are rotated to turn the bolts **58** which threadedly adjust themselves through the base plate **61** so as to raise or lower the entire associated platen by a single movement of the plate **60**. It will be noted that since the cutter structure is stationary, such adjustment may be made during the operation of the machine and as the shell is causing potatoes to travel annularly thereunder within the tunnels. As indicated more clearly in Fig. 7, as the shell is rotated, the potatoes are forced rearwardly principally by the frictional drag of the potato across the supporting members and the cutting blades and aided by centrifugal force. As the potatoes move to the rear of the tunnel, they are forced downwardly by the inclined upper wall **45** of the tunnels so that the potatoes are caused to move against the arcuate blades **52** which provide for the smooth slicing of each potato as it passes each cutter. It will be seen that the platens are normally adjusted to a position slightly below the plane of the cutting edges of the blades and thus the annular potato movement is intercepted by the blade and the uniform slice is removed from each potato as it passes each blade. After the potato passes over the cutting blade it is on a horizontal level which is higher than the platen by the distance of the thickness of the slice removed; hence, before another slice can be taken the potato must be lowered to the level of the succeeding platen. This is done by the potato guide **47** best shown in Fig. 7, which is here shown with the slope exaggerated as it would actually be the distance of the thickness of the slice. Since the space below the blades is open, the potato slices may freely pass downwardly as indicated in Fig. 7 and be received for disposition within any suitable equipment.

From the foregoing, it will be seen that the present invention provides a novel, simple and improved device by which potatoes are discharged into the feed hoppers, segregated as to size, and are delivered therefrom by sizes, the smaller potatoes being first delivered. Upon delivery of the potatoes from the hopper, they are caused to drop upon the rotating shell and be scooped therefrom into the tunnels. Since the very small potatoes are first delivered, they are first received within the tunnels and are therefore forced downwardly against the blade and rotated around the stationary portions of the apparatus so as to be sliced to the extent that they have moved toward the end of the tunnel, thus preventing the potatoes from riding up on the preceding potato and causing a

wedge shaped slice. It will be noted that the accurate relationship of the blade to the movement of the potatoes is such as to provide for slanting angular cut of the potatoes and thus to insure a smooth cut surface with a minimum of mutilated starch cells. It will further be noted that as the potatoes are sliced, the slices are dropped by gravity for suitable collection and that the potatoes are caused to continuously traverse the blade structure to be subjected to successive blades until the slices have fully consumed the article.

An important feature of the present invention is the fact that there are provided five tunnel structures within the rotating hood as opposed to four cutting blade assemblies and their associated platens. Thus, the efficiency of the apparatus is greatly improved and smooth vibrationless operation is enhanced. It will further be noted that since the platents directly preceding the cutting blades are vertically adjustable and since these platens are stationary, adjustment can be made during the operation of the device without requiring a shut-down of the apparatus for such adjustment. It will be further noted that the mounting of the blades is such that they may be readily inserted and removed in a small increment of time so that when such blades are to be exchanged or sharpened the required shut-down time of the machine is at a minimum. In considering the foregoing, it will be understood that the structural features and the design characteristics are presented merely by way of illustration.

Therefore it is apparent that in carrying out the invention numerous changes, modifications, and the full use of equivalents may be resorted to without departure from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. A rotary slicing apparatus including a fixed cutting blade, and rotary means for delivering articles to said blade, said means including a rotary shell surmounting said blade having a plurality of circularly arranged arcuately extending elongate article engaging tunnels.

2. A rotary slicing apparatus including a fixed cutting blade, and rotary means for delivering articles to said blade, said means including a rotary shell surmounting said blade having a plurality of circularly arrnged arcuately extending elongate article engaging tunnels, said tunnels having openings on the upper surface of the shell for receiving articles to be sliced.

3. A rotary slicing apparatus including a fixed cutting blade, and rotary means for delivering articles to said blade, said means including a rotary shell surmounting said blade having a plurality of circularly arranged arcuately extending elongate article engaging tunnels, said tunnels having openings on the upper surface of the shell for receiving articles to be sliced and downwardly sloping top walls for urging said articles downwardly into the plane of said blade.

4. A rotary slicing apparatus including a fixed cutting blade, and rotary means for delivering articles to said blade, said means including a rotary shell surmounting said blade having a plurality of circularly arranged arcuately extending elongate article engaging tunnels, said tunnels having openings on the upper surface of the shell for receiving articles to be sliced and downwardly sloping top walls for urging said articles downwardly into the plane of said blade, and a vertically adjustable relatively stationary platen positioned in front of the blade.

5. A potato slicer including a fixed base member fixedly mounting a circular series of slicing knives, stationary platens interposed between said knives, and rotary means for successively feeding potatoes to said knives, said platens being vertically adjustable to determine the thickness of the slice cut from each potato in traversing the knives.

6. A potato slicer including a fixed base member fixedly mounting a circular series of slicing knives, stationary platens interposed between said knives and rotary means for successively feeding potatoes to said knives, said platens being vertically adjustable to determine the thickness of the slice cut from each potato in traversing the knives during rotation of said rotary means.

7. A potato slicer including a fixed base member fixedly mounting a circular series of slicing knives, stationary platens interposed between said knives, and rotary means for successively feeding potatoes to said knives, said rotary means having a plurality of tunnels to receive potatoes from above and rotate them toward said blades therebelow.

8. The apparatus defined by claim 7 in which there are four cutting blades and five tunnels.

9. A slicer for forming thin slices of potatoes in preparation for the manufacture of potato chips comprising a potato feed hopper, means in said hopper for delivering the smaller potatoes of any batch received before delivery of the larger ones of such batch, a chamber for the reception of potatoes from said hopper, a rotary potato delivery and conveying means for receiving potatoes from said chamber, a stationary structure below said rotary means, stationary knives carried by said structure, said knives being in the path of travel of potatoes conveyed by said means.

10. A slicer for forming thin slices of potatoes in preparation for the manufacture of potato chips comprising a potato feed hopper, means in said hopper for delivering the smaller potatoes of any batch received before delivery of the larger ones of such batch, a chamber for the reception of potatoes from said hopper, a rotary potato delivery and conveying means for receiving potatoes from said chamber, said means comprising an inverted shell having a plurality of upwardly open tunnels to receive potatoes and deliver them therebelow, a stationary structure below said rotary means, a plurality of stationary knives carried by said structure, said knives being in the path of travel of potatoes conveyed by said means.

11. A slicer for forming thin slices of potatoes in preparation for the manufacture of potato chips comprising a potato feed hopper, means in said hopper for delivering the smaller potatoes of any batch received before delivery of the larger one of such batch, a chamber for the reception of potatoes from said hopper, a rotary potato delivery and conveying means for receiving potatoes from said chamber, said means comprising an inverted shell having five upwardly open tunnels to receive potatoes and deliver them therebelow, a stationary structure below said rotary means, four stationary knives carried by said structure, said knives being in the path of travel of potatoes conveyed by said means, and vertically adjustable platens mounted between said knives.

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