

[54] PINEAPPLE CORING AND RECORING
[75] Inventor: Leslie Vadas, Los Gatos, Calif.
[73] Assignee: Castle & Cooke, Inc.
[22] Filed: Nov. 11, 1971
[21] Appl. No.: 197,800

Related U.S. Application Data

[62] Division of Ser. No. 54,117, July 13, 1970, Pat. No. 3,642,043.
[52] U.S. Cl. 426/518, 99/564
[51] Int. Cl. A23n 3/12, A47j 25/00, A23p 1/00
[58] Field of Search 99/233.7-233.12, 564; 426/518

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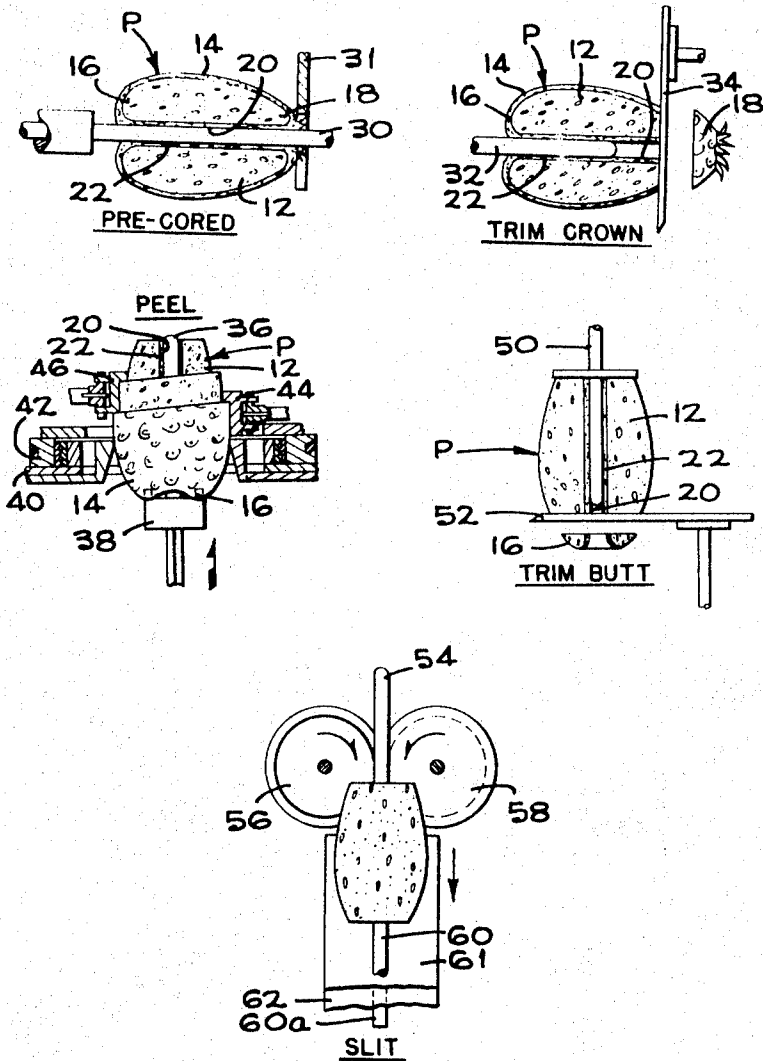
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Primary Examiner—Wayne A. Morse, Jr.
Attorney, Agent, or Firm—C. E. Tripp

[57] ABSTRACT

Pineapples are precored to leave a tubular back-bone of core material around the pre-core hole, which augments the strength of the fruit. The pre-cored pineapples are then peeled, axially slit into halves, and the halves inspected and trimmed. The semi-tubular back-bone of the core material is next removed from each half by a recoring operation. A rotary tubular knife is employed for recoring while the pineapples are advancing along guide bars that fit into the core recesses.

5 Claims, 20 Drawing Figures



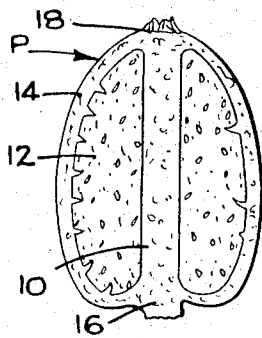


FIG. 1

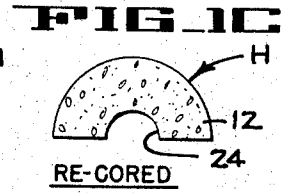
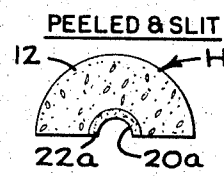
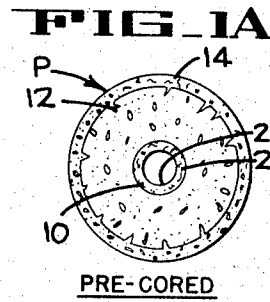


FIG. 1B

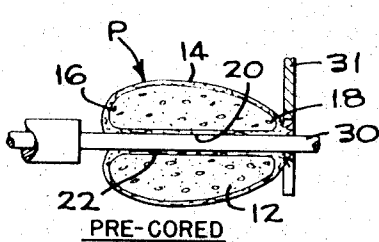


FIG. 2

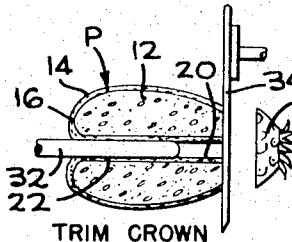


FIG. 3

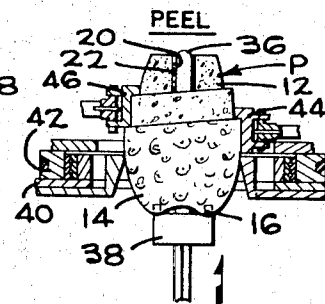


FIG. 4

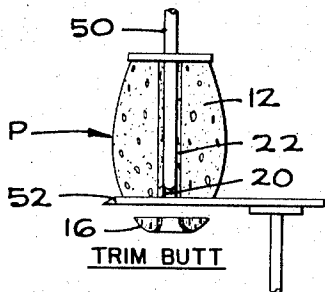


FIG. 5

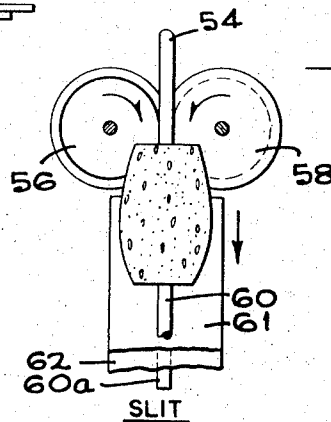
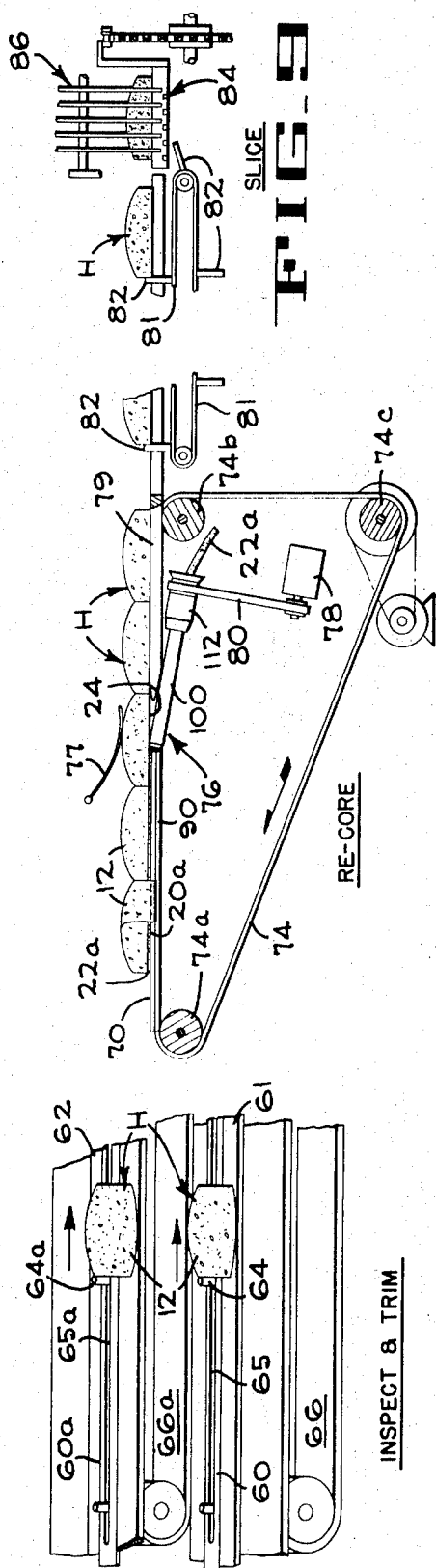
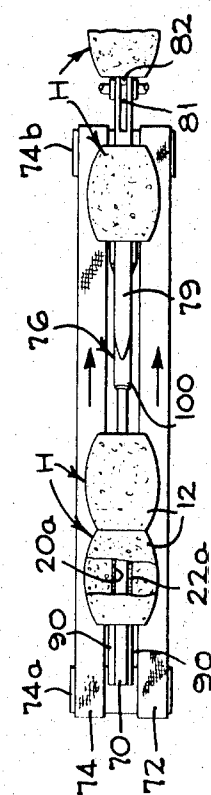


FIG. 6

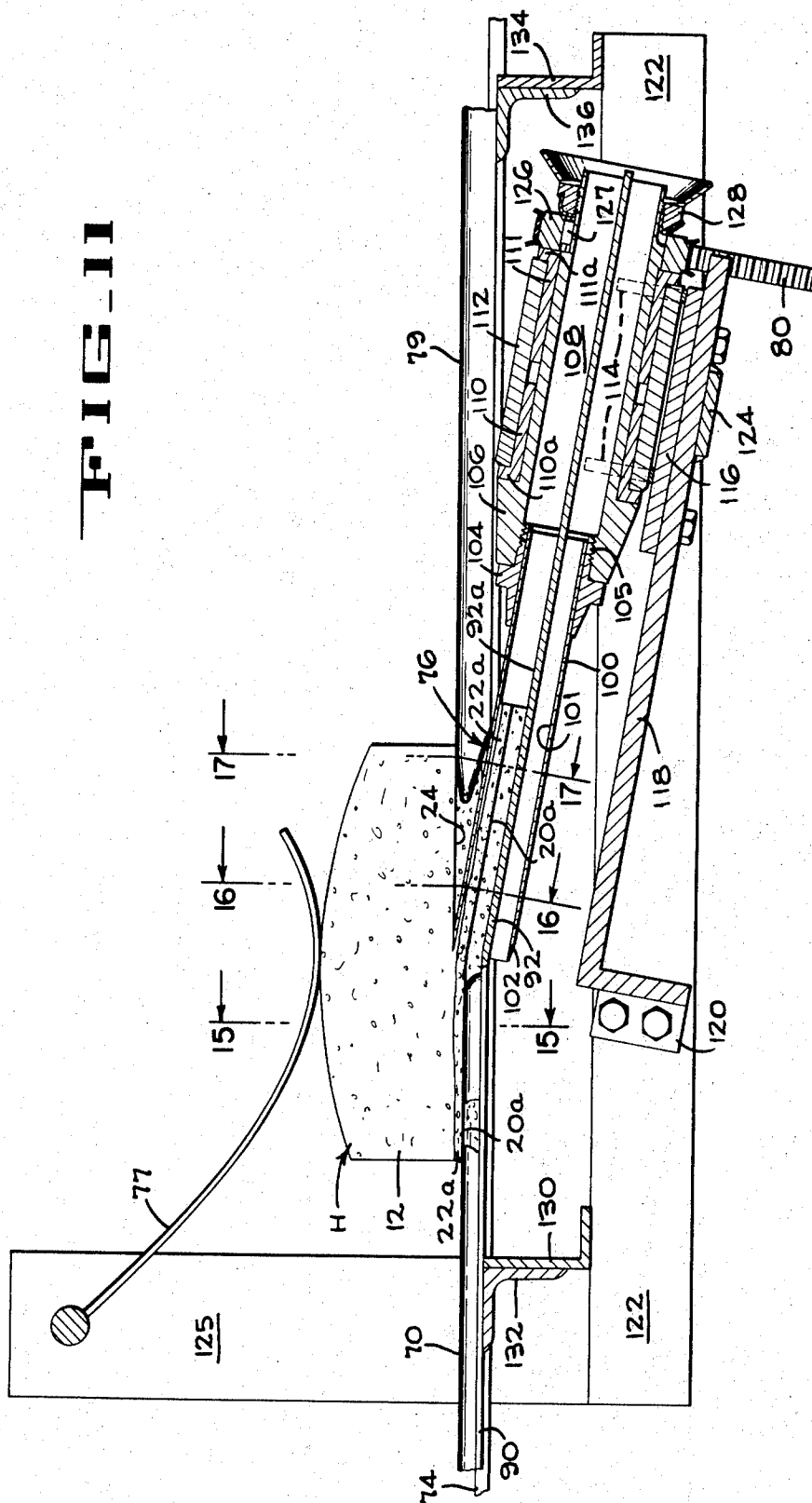


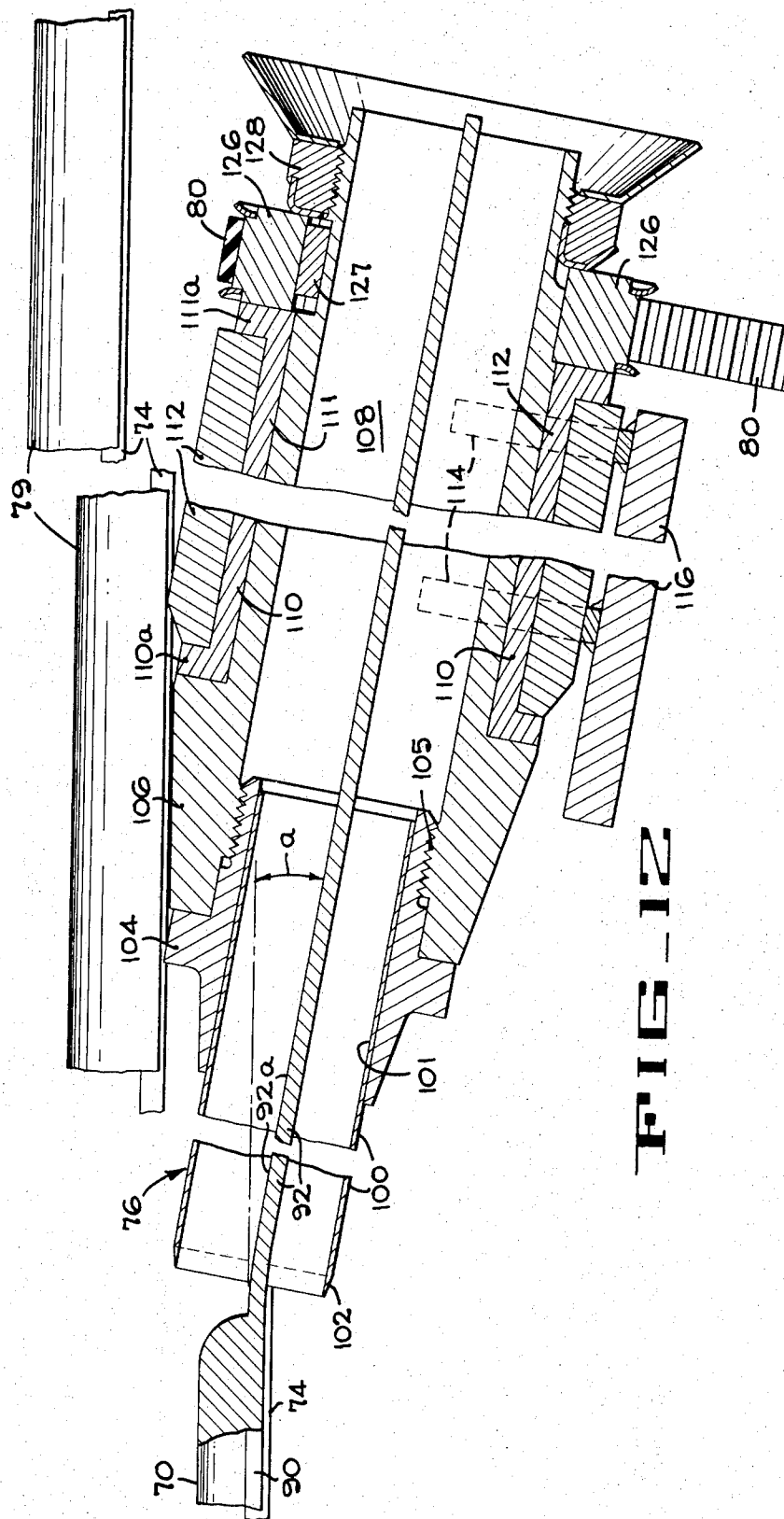
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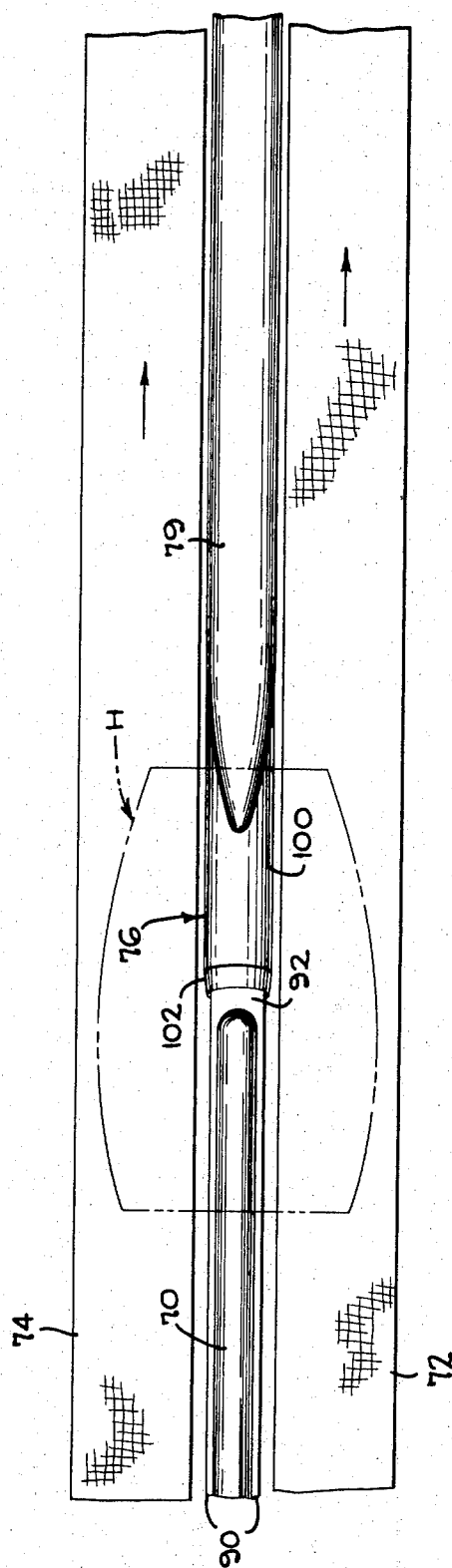
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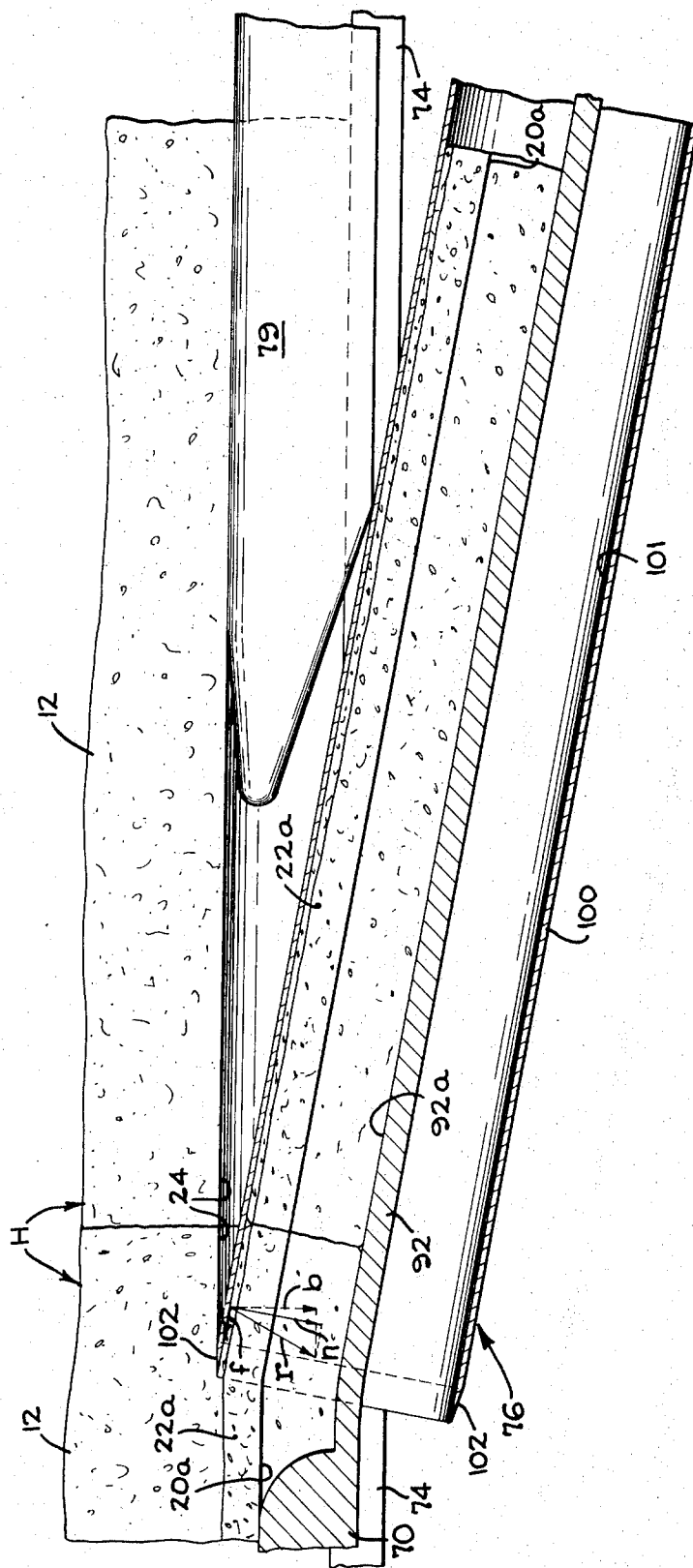




NEIGH

FIG. 13





FILE

FIG 15

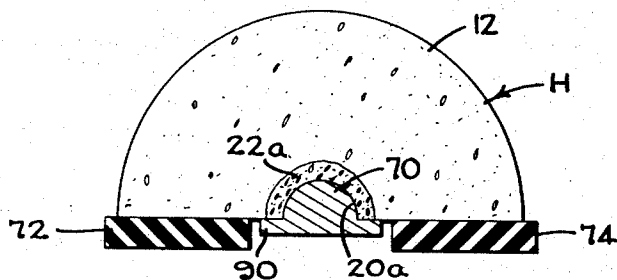


FIG 16

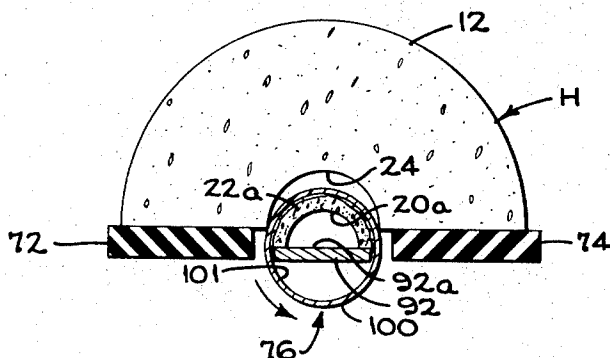
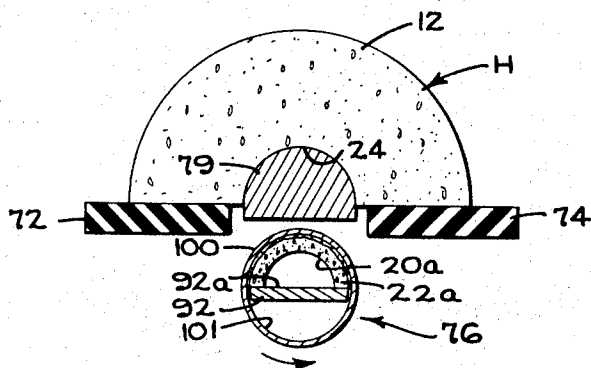


FIG 17



PINEAPPLE CORING AND RECORING

REFERENCE TO RELATED APPLICATIONS

This is a division of the copending application of L. Vadas Ser. No. 54,177, filed July 13, 1970, now U.S. Pat. No. 3,642,043 issued Feb. 15, 1972, for PINEAPPLE CORING AND RECORING and assigned to Castle & Cooke, Inc.

BRIEF DESCRIPTION OF THE PRIOR ART

The process of the present invention represents an improvement in preparing pineapples or the like for strip peeling, as disclosed in the United States patent to DeBack, Ser. No. 751,445, filed Aug. 9, 1968, assigned to Castle & Cooke, Inc.; as well as an improvement in preparing the fruit for use of the method and apparatus of the copending United States application of Vadas, Ser. No. 855,520, filed Sept. 5, 1969, also assigned to Castle & Cooke, Inc.

In the aforesaid Vadas application, whole pineapples are cored, the crowns are trimmed, and the pineapples are supported at their core hole for a rotary strip peeling operation. After trimming the butts of the peeled pineapples, the pineapples are axially slit into halves. The halves are guided by their core holes along platforms having guide bars that fit into the core recesses. The halves are inspected and trimmed, and then passed through a slicing machine and possibly a chunker for making segments.

The U.S. Pat. to Popeil No. 2,991,814, issued July 11, 1961, discloses supporting potatoes on ribbed supports and forcing the potatoes over corrugated blades for forming corrugated potato chips.

The U.S. Pat. to Nicoll et al No. 2,187,326, Jan. 16, 1940 discloses a pineapple cutting machine wherein precored cylinders are sliced in half and supported with their sliced faces upward while they are passed over a rotary recoring tube parallel to the plane of pineapple advance during recoring.

The U.S. Pat. to Duncan No. 1,769,664, July 1, 1930 shows a fruit preparation machine wherein the cut faces of fruit such as pears are supported on spaced belts that are advanced intermittently. During pause of the belts an intermittently rotatable looped coring knife removes the seed cells from the fruit.

SUMMARY OF THE INVENTION

It has been found that the forces engendered during rotary strip peeling operations of the type disclosed in the aforesaid deBack and Vadas disclosures are considerable. Soft or weak fruit sections may be torn out of the fruit during peeling. Also, when the entire core is removed before peeling, after the fruit has been peeled and slit into halves, the fruit is fragile and can be damaged by the handling operations necessary for inspection and trimming, as well as during the slicing (and possibly the chunking) operations that follow.

In accordance with the present invention, adequate structural strength is imparted to the pineapple during peeling, trimming and other processing operations after the peeled pineapples have been cut into halves. This improvement is effected by pre-coring the pineapples before they are peeled in a manner which leaves a tubular backbone of core material along the pineapple axis. The pre-cored pineapple is supported by the pre-core hole for trimming and peeling and the tubular backbone of core material remaining in the fruit reinforces

the peeled portions of the fruit. This resists torquing of peeled fruit portions from the unpeeled body of the pineapple under the action of the peeling knives.

In the preferred form of the invention, the cored, peeled pineapple, having the aforesaid tubular backbone of core material, is peeled, trimmed at its ends and axially slit into halves. These halves are guided by guide bars, ribs of the like, to further inspection and trimming stations. Since the semi-tubular backbone of core material is left intact in the body of the fruit, it strengthens the fruit against breakage and segmentation during these processing steps.

Before the material is sliced under the present invention, the tubular backbone of core material is removed from the pineapple halves by advancing the pineapples over an inclined, rotary tubular knife. The trailing portions of the pineapple halves are guided by bars that fit into the pre-core recesses and the end of the tubular knife is so formed and so inclined relative to the pineapple support that holddown forces are imparted to the fruit via the ribbon or strip of core material that is being removed by the knife. The enlarged semi-tubular core hole (which is now devoid of core material) is guided downstream of the knife by another guide bar that fits within the recore recess. The pineapples thus recorded are ready for slicing and possibly for chunking or other final processing operations before packing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 in the diagram is the vertical section of a whole pineapple.

FIG. 1A is a transverse section to the pineapple after it has been pre-cored in accordance with the present invention.

FIG. 1B is a transverse section through a pineapple half after the pre-cored pineapple has been peeled and halved.

FIG. 1C is a transverse section through a pineapple half after it has been recored in accordance with the present invention.

FIG. 2 is a diagram showing the pre-coring operation on a whole pineapple.

FIG. 3 is a diagram showing trimming the crown of the whole pineapple after pre-coring.

FIG. 4 is a diagram showing a strip peeling operation on a pre-cored pineapple.

FIG. 5 is a diagram showing trimming the butt end of the peeled pineapple.

FIG. 6 is a diagram showing the slitting operation on the peeled and trimmed pineapple.

FIG. 7 is a diagram showing how the pineapple halves are guided and presented for inspection and trimming.

FIG. 8 is a diagram showing the recoring operation on the pineapple halves in accordance with the present invention.

FIG. 9 is a diagram illustrating processes subsequent to recoring, such as slicing the halves.

FIG. 10 is a plan of the apparatus shown in FIG. 8.

FIG. 11 is an enlarged fragmentary section through the recoring apparatus.

FIG. 12 is a still larger partial section through the recoring knife assembly.

FIG. 13 is a plan view of the recoring knife assembly of FIG. 12.

FIG. 14 is a still larger fragmentary section illustrating the principles of the recoring operation of the present invention.

FIGS. 15, 16, and 17 are sections taken as indicated on FIG. 11.

DETAILED DESCRIPTION

The present invention will be illustrated in connection with the processing of pineapples. FIG. 1 is a cross section of a typical pineapple P showing the core 10, the flesh 12, the skin 14, including the eyes, the butt end 16 and the crown end 18.

FIG. 1A is a transverse section through the pineapple after it has been pre-cored in accordance with the present invention. A pre-core hole 20 has been formed in the pineapple by removing the central cylindrical portion of the core 10, leaving a tubular backbone portion 22 of the core material in accordance with the present invention.

FIG. 1B shows a pineapple half H after it has been peeled and slit. Here a semi-tubular backbone of core material 22a surrounds the pre-core hole portion 20a and provides a backbone of core material around the pre-core hole for strengthening the pineapple half during trimming, inspection and processing.

FIG. 1C shows the pineapple half H after it has been recored in accordance with the present invention, to remove the semi-tubular backbone of material 22a shown in FIG. 1B. This leaves a semi-cylindrical recore recess 24 that can be used for guiding the pineapple during processing as will be explained presently.

FIGS. 2 - 6 are diagrammatic views illustrating typical processing steps that precede the recoring apparatus of the present invention, for producing the pineapple elements shown in FIGS. 1 - 1B.

In FIG. 2 the pineapple P is pre-cored to produce the pre-core hole 20 previously described. This can be accomplished by techniques well known in the prior art, such as the introduction of a coring tube 30 through the pineapple while the latter is centered using conventional apparatus (not shown). A stop 31 restrains the pineapple against the force of the coring tube 30.

FIG. 3 is a diagram showing how the crown end 18 of the pineapple is removed before peeling. A spindle 32 is inserted in the pre-core hole 20 previously formed and backed up by the tubular backbone 22 of core material. The crown end 18 of the pineapple is sliced off by means of a rotating knife 34 in accordance with conventional techniques.

FIG. 4 is a simplified diagram illustrating a double knife strip peeling operation preformed on the pineapple, such as that carried out in the aforesaid deBack patent. A spindle 36, backed up by a driving collar 38 receives the pineapple with the spindle protruding through the pre-core hole 20. It will be noted that the tubular backbone 22 of core material is present and reinforces the pineapple during the peeling operation. In the peeler (illustrated diagrammatically), a base 40 mounts a rotor 42, the latter carrying a first-cut knife 44 which removes the shell of the pineapple and a second-cut knife 46 which removes the eyes. During this operation, the peeled portion of the pineapple is reinforced by the backbone 22 which inhibits tearing loose the flesh and chunking off part or all of the peeled portion of the fruit.

FIG. 5 is a diagram showing how to trim the butt 16 from the peeled pineapple for this operation. A spindle

50 is inserted in the pre-core hole 20 for guiding the pineapple while the butt end 16 is being trimmed by a rotary knife 52.

FIG. 6 is a diagram showing how the pineapple can be sliced into halves and eighths. The peeled and trimmed pineapple P of FIG. 5 is slid down over a vertical post 54 which guides the pineapple by the pre-core hole 20, backed up by the backbone 22 of core material.

The pineapples are sliced into halves by a rotary knives 56, 58 and each half is guided by a rib 60 that is received by the precore hole portion 20a (see also FIG. 7). The rib 60 is supported on a guide track 61 and a similar track 62 supports another rib 60a for the complementary pineapple half.

FIG. 7 is a diagram showing how the pineapple halves H can be conveyed along horizontal paths for inspection and trimming. Reference is made to the aforesaid Vadas application for additional details of this operation. Briefly the pineapple is guided on the tracks 61, 62 previously mentioned and moved along horizontal portions of these tracks by pushers 64, 64a, the latter projecting up through slots 65, 65a formed in the respective guide ribs 60, 60a. The pusher fingers 64, 64a can be mounted on endless belts 66, 66a, it being understood the details of the means for conveying the pineapples are not critical to the present invention. The essential feature is that the pineapple halves, as illustrated in FIG. 1B, embody the semi-tubular backbone of core material 22a during this operation which reinforces them while they are being handled and trimmed as required.

FIG. 8 is a side view diagram of the recoring operation of the present invention and FIG. 10 is a plan view thereof. The pineapple halves H are placed on and guided by ribs 70 which fit into the recore hole portions 20a formed in the semi-tubular backbone material 22a. The pineapple halves are advanced along the guide ribs 70 by conveyor belts 72, 74 which support the sliced faces of the halves. As seen in FIG. 8, the belts 72, 74 are guided over pulleys 74a, 74b and 74c. The pineapple halves are thus pushed over a recore knife which is a rotatable tubular knife that removes the semi-tubular backbone material 22a as a strip and forms the recore hole 24 previously illustrated in FIG. 1C.

Although the recoring knife 76 is at an acute angle to the path of motion of the pineapple halves and exerts a hold-down motion thereon, it is contemplated that a leaf hold-down spring 77 can be fitted above the knife to insure that the recoring operation will be properly initiated and maintained during process of the pineapple halves past the knife 76. The recore knife 76 is driven by an electric motor 78 and belt 80, it being understood that the mounting of the knife will be described in detail presently.

A downstream guide rib 79 of the diameter having a radius that matches the radius of the recore hole 24 is disposed downstream of the rotary core knife 76 for further guiding the recored pineapple halves to a processing apparatus. The recored pineapple halves are picked up by a pusher conveyor 81 shown at the right of these diagrams, which conveyor may employ pusher fingers 82 for advancing the recored pineapple halves to a slicer. FIG. 9 is a diagram showing how the pickup conveyor 81 advances the recored pineapple halves H to a cross conveyor 84 for slicing by a knife assembly 86. The details of this operation are not critical to the

present invention and reference may be made to the aforesaid Vadas application to an apparatus suitable for conveying and slicing pineapple halves formed in accordance with the present invention.

FIG. 11 is a vertical section through the recoring knife 76 and associated equipment.

FIG. 12 is an enlarged fragmentary section of the knife assembly, and FIG. 13 is a plan of FIG. 11. Reference is now made to these figures as well as to the sectional use of FIGS. 15-17 for showing structural details of the preferred embodiment of the invention.

As best seen in FIG. 15, the guide rib 70, that leads the pineapple halves to the recore knife actually projects upwardly from a narrow plate or rib 90, which rib has an extension or tongue 92 (FIGS. 11, 12 and 14) that is bent down and extends through the tubular coring knife 76. The upper face 92a of the tongue 92 lies on a diameter of the tubular coring knife (FIGS. 16 and 17).

The coring knife assembly 76 includes a knife 100 (FIGS. 11 and 12) that is formed of stainless steel tubing and in the embodiment shown has an outside diameter of 1 1/4 inches and a wall thickness of about 0.040 inches. The free end of the knife tube is beveled at 102 to form the cutting edge and the angle between the bevel 102 and the axis of the knife 100 equals the angle of inclination "a" (FIG. 12) between the axis of the knife and the path of motion of the conveyor system for the pineapple halves. In the embodiment shown, the angle "a" is 10°. This design places the uppermost element of the knife bevel 102 parallel to the path of motion of the pineapple halves.

The inner end of the knife tube 100 is brazed to a threaded collar 104 (FIG. 12) which is threaded at 105 into a rotating hollow thimble 106 having a bore 108 for receiving the projecting tongue 92a that supports the semi-tubular strip of core material 22a as it is removed by the knife. The thimble 106 mounts external bearings 110, 111 (FIG. 11) which rotatably mount the thimble in a fixed sleeve 112. The fixed sleeve 112 is welded to arcuate cradles 114 (FIG. 12) which project upwardly from a base plate 116. The base plate 116 is bolted to a bracket 118 (FIG. 11) that is secured by means of ears 120 to a horizontal frame element 122. A cross bar 124 mounts the other end of the bracket 118 to the frame element 122 as seen in FIG. 11. A bracket 125 projects from the frame 122 for supporting the hold-down spring 77.

Referring to FIG. 12, the thimble bearing 110 is flanged at 110a to axially restrain the thimble in the sleeve 112 in one direction and the bearing 111 is flanged at 111a to axially locate the thimble in the other direction. The thimble 106 is axially retained in the sleeve 112 by a drive pulley 126 keyed to the thimble at 127 and retained by a thimble nut 128. The pulley 126 is driven by the timing belt 80 previously mentioned. Thus, rotation of the timing belt and the drive pulley 126 turns the thimble 106 within the fixed sleeve 112 and hence turns the tubular knife tube 100 so that the cutting edge 102 thereof will remove the semi-tubular strip of backbone material 22a from the pre-cored pineapple halves as previously described. In the embodiment of the invention being described, the knife 100 is rotated at about 200 rpm.

The longitudinal frame elements 122 mount angles 130, 132 (FIG. 11) which support the lead-in guide rib

70 and similarly angles 134, 136 support the take-away guide rib 79 for the recored pineapple halves.

FIG. 14 which is an enlarged diagrammatic view of the nose of the knife 100 and its cutting action shows how this assembly produces a hold-down force on the pineapple halves H being recored. As shown by the vector diagram in FIG. 14, the cutting edge 102 of the knife 100 exerts a frictional force on the pineapple core along the axis of the knife, which force is indicated at "f". This force must be overcome by the conveying action of the belts 72, 74. Since the inclination angle "a" is small (10°), the knife exerts a relatively large force on the strip 22a that is normal to the axis of the knife and this force is indicated at "n". The resultant force of the knife on the pineapple is indicated at "r". The resultant force "r" has a vertical component "b" which can be considered to be the hold-down force that supplements the force of gravity in retaining the pineapple halves on the belt 72, 74 while they are being recored.

The sections of FIGS. 15-17 shows stages in a recoring operation. FIG. 15, as previously described, shows how the guide rib 70 fits up within the pre-core hole portion 20a surrounded by the semi-tubular body of core material 22a as the pineapple is being conveyed by the belts 72, 74.

FIG. 16 illustrates how the semi-tubular body of core material 22a is being removed to form the recore aperture 24 with the body 22a supported on the diametral surface 92a of the tongue 92, inside the knife 100.

FIG. 17 is a section taken farther downstream of the knife tube 100 and illustrates continuation of the action shown in FIG. 16. Here the recore hole 24 has been picked up by the downstream guide rib 79. The semi-tubular body 22a of core material is being guided through the knife by the tongue 92.

In operation, the steps required to produce peeled pineapple halves which have been pre-cored to produce the pre-core hole 20a have been previously described and will not be repeated. When the pineapple halves H are guided or placed onto the recoring belts 72, 74 they are guided by the ribs 70 upstream of the knife assembly 76. As the pineapple half first engages the rotating cutting edge of the knife 100 the semi-tubular backbone 22a of core material is removed as a strip which is confined between the wall of the tubular bore 101 of the tubular knife and the upper face 92a of the tongue 92. As the pineapple halves progress over the rotating knife, the removed core material 22a snakes its way down along the tongue 92, passes through the bore 108 in the thimble 106 and out the free end of the knife assembly. The pineapples thus recored are pushed down along the recore guide rib 79 and on for further processing as previously described. The small knife inclination angle "a", which is preferably about 10° results in a hold-down force on the pineapple halves during the recoring operation (FIG. 12). The semi-tubular bodies of the core material 22a are relatively flexible and readily accommodate to the space between the interior walls of knife assembly and the tongue 72, for passage out of the recoring assembly. Having been inspected and trimmed before recoring, the pineapple halves remain intact after recoring, and hence a large percentage of good slices, etc., is obtained by subsequent processing.

Although the best mode contemplated for carrying out the present invention has been herein shown and

described, it will be apparent that modification and variation may be made without departing from what is regarded to be the subject matter of the invention.

I claim:

1. The method of removing core material from axially severed pineapple halves comprising the steps of supporting the halves on their severed faces by means of an elongate support having an aperture therein, cutting out a semi-cylindrical strip of core material from the fruit halves through the support aperture while advancing the fruit along the support, and holding the fruit halves down via the removed material during the cutting operation by means of the cutter, said core cutting operation being performed by rotating a tubular knife that projects axially rearwardly and upwardly through the support aperture, supporting the strip of removed core material within and at substantially the midplane of the tubular knife, and causing the cutting end of the knife to hold the fruit halves against the support via the strip of removed material at its junction with each fruit half body.

2. A method for processing pineapples of the type wherein the fruit is cored, contour peeled while rotating the fruit solely by its base end, axially split into halves and the halves are supported on their cut faces and advanced along their support while being guided by their core holes; the improvement wherein the whole fruit is cored before peeling by a precoring step that leaves an unmutilated tubular backbone of core material around the precore hole in the fruit, peeling the fruit without mutilating said backbone of core material, guiding the fruit halves by a guide that fits their precore holes while supporting them on their cut faces, recoring the fruit halves along their entire length while the halves are advancing by a rotary recoring knife projecting up through the support to progressively remove the remaining semi-tubular backbone of core material

from around the precore hole, and guiding the fruit halves by a larger guide that fits their recore holes after the recoring, the larger guide being just downstream of the recoring knife.

3. The method of processing cored pineapple halves of the type wherein the halves are supported on their cut faces and advanced along their support while being guided by their core holes; the improvement wherein the pineapples are initially cored by a precoring step that leaves an unmutilated tubular backbone of core material around the precore hole on the fruit, guiding the fruit half by means of its semi-cylindrical precore hole while advancing the half along its support, cutting a semi-tubular body of core material that surrounds the precore hole from the advancing and guided fruit half to recore the fruit half, and further guiding the recored portion of the advancing fruit half by its newly formed recore hole in a zone downstream of said recoring operation, said recoring operation being performed by rotating a knife that projects up into the fruit half intermediate its guided zones, said knife being tubular and inclined from the path of fruit advance by an acute angle so that its cutting end exerts a hold-down force on the body of core material being removed at the junction of the latter with the fruit body, and supporting the semi-cylindrical strip of core material removed by the knife along a mid-portion of the tubular knife interior as the core material is forced through the knife.

4. The method of claim 3, including the steps of advancing fruit halves substantially end to end over the knife, and causing the strip of core material being removed from a fruit half being recored to engage the end of and eject the previously removed strip of core material from the interior of the tubular knife.

5. The method of claim 3, wherein said acute angle of the coring knife is about 10°.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,806,620
DATED : April 23, 1974
INVENTOR(S) : LESLIE VADAS

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, line 9, change "DESCRIPTG" to -- Description

line 26, change "corded" to -- cored --.

Signed and Sealed this

fourth Day of November 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks