May 20, 1952 D. R. BAILEY 2,597,279

APPARATUS FOR HALVING ALMONDS

Filed June 1, 1948

Fig. 1.

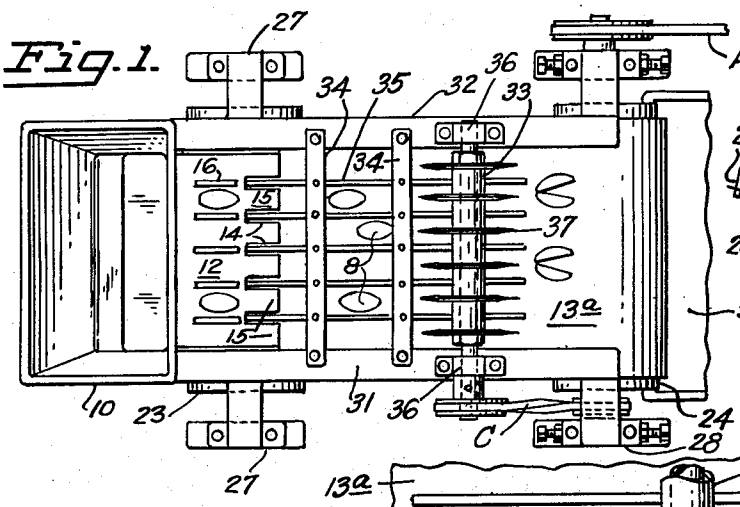
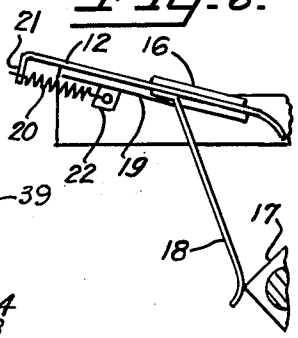


Fig. 6.



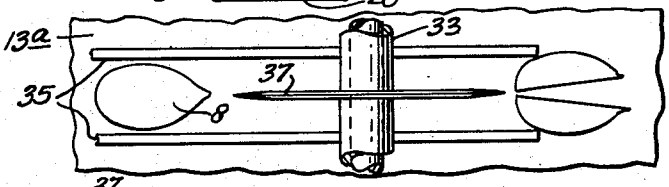


Fig. 4.

Fig. 2.

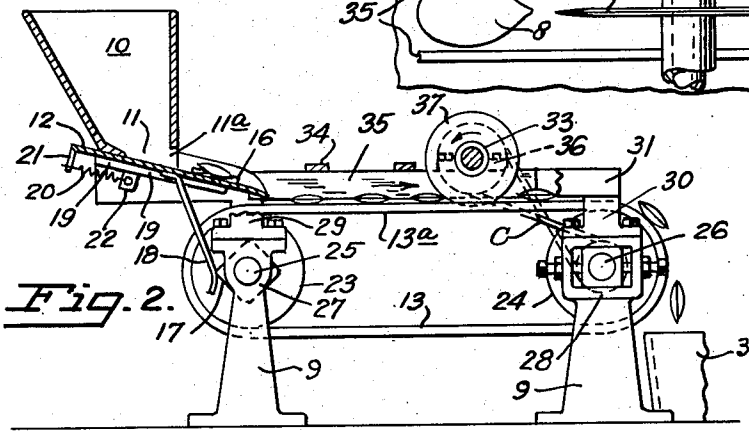


Fig. 5.

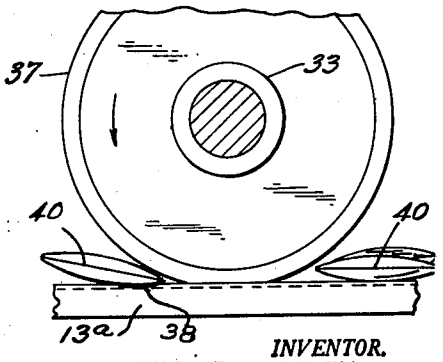
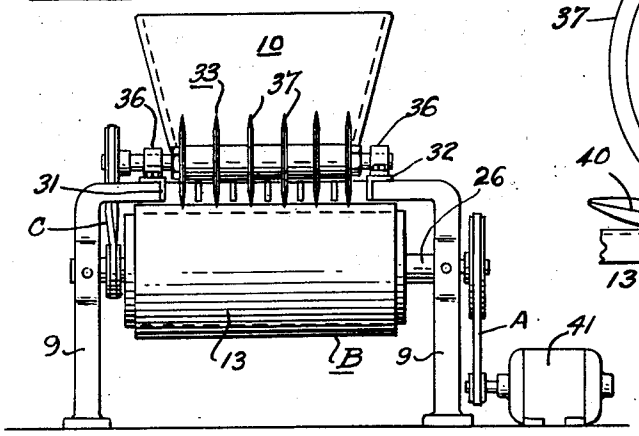


Fig. 3.



INVENTOR.
DAVID R. BAILEY
BY
ATTORNEY

Patented May 20, 1952 2,597,279

UNITED STATES PATENT OFFICE

2,597,279

APPARATUS FOR HALVING ALMONDS

David R. Bailey, Sacramento, Calif.

Application June 1, 1948, Serial No. 30,279

6 Claims. (Cl. 146—73)

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This invention relates to a method and apparatus for halving the kernels of almond nuts, and more particularly to such a method and apparatus for halving the shelled almonds longitudinally perpendicularly to the plane of the relatively flat planar segments into which the almond kernel is divided in its natural growth by a so-called seam.

As is well known, the almond kernel grows in a husk and shell which are removed from the kernel. It is the kernel which is referred to herein as the almond. The almond kernel has an elongated ovoidal body, relatively wide parallel to the seam and relatively thin in a plane perpendicular thereto, and is divided in its natural growth into bisegmental parts or planar halves superficially opposed in face to face contact at the seam.

When an almond kernel is divided into halves or segments at the plane of this seam of superficial contact, it is termed "splitting," for which a related application has been filed simultaneously herewith. The present invention relates to halving the almond kernel, preferably longitudinally, in a plane substantially perpendicular to the plane of the seam.

Many advantageous uses and needs for the almonds thus halved are present in the bakery, confectionery and other arts. The primary purpose, of course, is to convert larger almond kernels into a plurality of smaller pieces of approximately the same size as the smaller grades of whole kernels, yet maintain the same thickness.

It is also to be noted that the almond kernels when dried for use, as known in commerce, are relatively brittle, and attempts to halve them, other than by splitting as planar segments, frequently causes them to shatter, chip, and also produces a large amount of small pieces or particles called slivers and flour which must be sold as a by-product at a considerably reduced price.

Therefore, among the objects of the invention is to provide a method and apparatus for halving almonds longitudinally and perpendicularly to the planar halves or segments.

A further object is to provide an apparatus for conveying almonds to a cutter blade, with the almond body resting on its broad face and longitudinally disposed in a plane transverse of and perpendicular to the cutter blade.

A further object is to provide a method of treating almonds to eliminate brittleness during a cutting operation, and to avoid mold and rancidity after cutting.

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With the foregoing and other objects in view, which will be apparent from, or more fully set forth in this specification, one form in which the method may be practiced and the apparatus embodied, is set forth herein, the apparatus being illustrated in the accompanying drawing, it being understood that variation of detail may be resorted to without departing from the spirit of the invention which is defined in the appended claims.

In the accompanying drawing which illustrates one form of embodiment of apparatus of the invention:

Fig. 1 is a plan view of apparatus of the invention.

Fig. 2 is a longitudinal vertical side elevation of Fig. 1, partly in section and partly broken away.

Fig. 3 is an end view of the apparatus of Fig. 1.

Fig. 4 is a fragmentary enlarged portion of the apparatus of Fig. 1.

Fig. 5 is a fragmentary enlarged side elevation of a portion of the apparatus of Fig. 2.

Fig. 6 is a fragmentary enlarged side elevational view of vibrating means.

The method of the invention will be described in connection with description of operation of the apparatus, since certain steps of the method are capable of being performed by the apparatus, and other steps are taken preparatory to, as well as subsequent to passing almonds 8 through the apparatus.

Referring to the drawing in which like reference characters indicate corresponding parts in the several views, assuming any suitable supports 9 are provided, 10 is a vertically disposed feed hopper having an open discharge end 11 at its lower end providing a transverse slotted opening 11*a* of slightly greater height of opening than the thickness of body perpendicular to the seam of almond kernels in process. The feed hopper thus feeds almond kernels onto a receiving vibrated shaker plate 12 underlying the discharge end of the hopper and transversely of the planar upper flight 13*a* of an elongated conveyor belt 13. The shaker plate is reciprocably mounted for vibration or shaking upon a track 19. The greater portion of the shaker plate adjacent the feed hopper is inclined downwardly, but less than an angle of free slippage, from a horizontal plane toward the upper conveyor flight 13*a* of belt 13 which is preferably of a material just a trifle spongy or resilient and having non-slippage quality, such as a well-known rubber composition reinforced with tex-

tile threads. At its portion adjacent the conveyor belt the shaker plate has its end portion angled downwardly toward the belt at a greater degree of angle, said end portion having elongated slots 14 therein so that said end portion of the shaker plate is provided with relatively spaced tongues 15 turned downwardly to substantially contact the upper flight 13a of the conveyor belt, with allowance for free sliding clearance of the belt.

Intermediate its end the shaker plate is provided with longitudinal almond aligning bars 16 which are in substantial alignment with the slots 14, and extend therefrom toward the discharge opening of the hopper. These aligning bars are more of the nature of relatively thin strips preferably of less height than the thickness of the almond bodies, so that an almond which happens to be received athwart and resting on its rounded center portion or belly would, by the vibration or shaking of the plate, be turned so that it will be agitated into the valley space between the aligning bars with its longitudinal beam or axis lengthwise substantially parallel with the aligning bars and with its seam parallel with the shaker plate. At such position the longitudinal dimension of the almond would be aligned with the inclined tongue members 15. Since the shaker plate and tongues are inclined downwardly, the almond is also advanced toward the conveyor belt by gravity down the incline regardless of whether the shaker plate be vibrated transversely or longitudinally or both, but in the present exemplification the shaker plate is vibrated longitudinally relative to conveyor belt 13 by any suitable vibrating means, illustrated herein as a square cam 17 mounted for rotation on one of the shafts which drives the conveyor belt 13. The cam contacts one end of an arm 18, the opposite end of which connects with shaker plate 12 which slides in track members 19. The shaker plate is vibrated against compression of a spring 20 mounted between a downturned flange 21 on the plate and a lug 22 on the track member. Obviously the cam moves the shaker plate in one direction and upon release of cam pressure, the plate snaps back to its former normal position responsive to the spring, thus arranging the almonds longitudinally between the aligning bars 16 and advancing them to the belt between guide rails 35 to be described.

The conveyor belt 13 is continuous and is mounted at the opposite ends of its loop upon rollers 23, 24 which rotate to move the upper flight 13a away from the feed means, as shown by arrow. The rollers 23, 24 are suitably rotated upon shafts 25, 26 which have journal bearings in supports 27, 28. The journal bearing supports 27, 28 have upwardly extended bracket arms 29, 30 supporting angle irons 31, 32 which are adjacent opposite longitudinal edges of the upper flight 13a of the conveyor belt and extend substantially the full length thereof, being at an elevation above the upper flight of the belt sufficient for clearance but close enough to prevent almonds from slipping thereunder. One flange plate of each of the angle irons is perpendicular to the belt and serves as a retaining sidewall for the almonds on the belt and the other flange is parallel to the plane of the belt and serves as supporting means for a knife arbor 33, and crossrods 34, which are thus vertically spaced above and transversely of the conveyor belt intermediate its ends.

Depending from the crossrods 34 are a plurality of parallel guide rails 35 longitudinally and perpendicularly disposed relative to the underlying belt 13 and having the lower edge spaced therefrom sufficiently to provide clearance for the moving belt, but closely enough to the belt to prevent almonds from moving thereunder, thus providing a guide means to maintain the almonds disposed lengthwise on the belt while they are conveyed to cutting knives to be described.

The guide rails are relatively spaced transversely of the belt so as to provide guiding tracks or channels in which almonds may be conveyed on the conveyor belt. The guide rails 35 are in general alignment with the almond-aligning bars 16 and enter into slots 14 of the tongues 15 of the shaker plate, there being sufficient clearance between the guide rails and the tongues to permit the shaker plate to be vibrated as hereinbefore described. Thus, the downwardly inclined tongues between the guide rails provide chutes for directing almonds from the shaker plate to the channels. Since the aligning bars are spaced to adjust the almond on its longitudinal axis, the guide rails are relatively spaced transversely of the belt slightly more than the transverse width of the almonds which are to be employed.

A cutting or slitting station is provided at the knife arbor 33, whereat means are provided for cutting or slitting the nut kernels through the body thereof, to divide them into separate parts along their major axis and perpendicular to the natural seam.

The knife arbor 33 is transversely parallel to and within the length of the belt spaced relative to the end rollers, and has journaled bearing at its opposite ends upon the angle iron supports 31 and 32 for rotation in bearings 36. The arbor and knives thereon provide a cutting or slitting station or position transversely of the belt, the arbor having securely mounted thereon for rotation thereby a plurality of relatively spaced circular disc cutting knives 37 the planes of which are longitudinally of and perpendicular to the belt, and are spaced transversely across the planar conveyor face of the belt so that a knife blade is transversely centered relative to each almond track channel between the guide rails. In this connection it will be noted that the guide rails and channels extend both forwardly of and beyond the knives, so that the knives are within the length of the guide channels and cut the almonds while the almonds are on the belt and between the walls of the guide means. The cutting edges of the knives which initially engage the almonds rotate downwardly toward the belt face on which the almonds are conveyed, as indicated by arrow in Fig. 2, counterclockwise for the illustrated direction of feed, but clockwise for an opposite direction of feed. Observe that the circumferential sharpened cutting edges of the knives slightly penetrate the surface of the conveyor belt, practically to a superficial extent only, the penetration being only sufficient to insure complete severance of the almond, without the sharpened edge substantially penetrating the belt which would dull the knife edge and deteriorate the belt.

Though it is believed apparent what is meant by the seam of the natural almond, it has been designated 40 in Fig. 5.

Obviously any suitable drive means may be employed for the several rotated parts, a drive train being conventionally indicated from motor 41 to drive belt A to conveyor belt B, and to twisted drive belt C, so that upper flight 13a of the belt moves from left to right and the

cutting knife rotates counterclockwise toward the belt at the cutting edge initially contacting the fed almonds.

In stating the operation of the apparatus, and in practice of the method of the invention, it should first be stated that almond kernels, when they come fresh from the tree, are usually moist and soft and of a somewhat tough partially pliable consistency, or in other words, they do not crunch and shatter as the dried shelled almond known in commerce. In order to preserve them against mold and rancidity they are throughly dried following the harvesting, and after the outer husk has been removed. Following this drying or curing process the shell is removed, producing the crunchy brittle shatterable kernel of commerce. As previously stated, if the dried brittle almonds were passed through the apparatus, they would shatter, chip and produce a large quantity of small chips and flour. Therefore, the first step in the process after selecting the grade of almonds to be processed, is that the selected whole dried shelled almond kernels are first moistened to make them pliable and non-shatterable. This may be accomplished in several ways, three of which are set forth.

One satisfactory method of moistening the dried almonds to restore pliability is by immersing them in cold water for a short period of time, for example, five seconds, merely to thoroughly wet the exterior, and then permit them to stand, preferably in the same container, for approximately 12 hours so that the moisture may slowly and completely penetrate the almond body and thus restore its pliability throughout the body by absorption. This method of restoring the pliability permits large quantities to be so treated in batches in 100-pound or even larger quantities enclosed in porous sacks or perforated bins. Preferably the almonds are moistened the evening of one day for operation through the apparatus the following morning.

A second and quicker method of restoring pliability is to expose the almonds to wet steam in a closed container for approximately ten minutes, the pressure of the steam serving to force moisture through a batch of almonds and to permeate through the body of the individual almond. This second method involves a greater expense of handling, but is quicker because the almonds may be passed through the apparatus for halving immediately thereafter.

A third method of restoring the pliability of the almond kernels takes into account the latent moisture and oil in the dried almonds. It has been found by experience that the pliability may also be restored by heating the dried almonds in a non-aerated container, that is, without exhausting the air therein which is moistened by the heated almonds. Preferably a rotating drum is employed in which the temperature of the almonds is raised to substantially 200 degrees F., for approximately 20 minutes, after which they may be immediately halved while still retaining the heat.

The almonds, with pliability restored, are then dumped in mass into the feed hopper **10** and fed responsive to gravity through the feed opening **11** and slot **11***a* to the downward inclined vibrated shaker plate **12** and to aligning bars **16** thereon, which align the almonds longitudinally with the tongues **15** and the chutes provided thereby between the overlapping ends of the guide bars **35** extending into the slots **14** of the shaker plate. The almonds are thus deposited

in end to end relation on the conveyor belt **13** in the channels between the guide parallel rails, their longitudinal beam or axis being parallel to the guide rails and their natural planar segmental seam parallel with the belt which conveys them, thus lengthwise aligned and planar disposed, to the rotated disc cutting knives **37**, a cutting edge of each knife being transversely centrally between guides **35** and positioned between the ends of the guides so that the cutting operation is performed while the almonds are being conveyed and guided in a defined path and supported resiliently against the cutting edge by the adjacent resilient face portion of the body of the belt, the cutting edge superficially penetrating the resilient face portion of the belt.

Referring to Fig. 5 it will be noted that the almond is thinner at its perimetral edge than at its central portion, so that it is tilted slightly when its relatively thin edge is first contacted by the blade of the disc knife rotating counterclockwise towards the belt. Since the belt has a degree of resilience and non-slip quality, the almond is thus pressed very slightly into the belt and partially gripped as at **38** to prevent its sliding backward away from the knife and it is thus propelled forwardly by both knife blade and belt in the cutting operation. Obviously, since the edge of the knife blade very slightly enters into the surface of the moving belt, the almonds on the belt will be completely severed into two segments which are substantially, though not mathematically, halves of the kernel. After cutting, the cut segments are conveyed by the belt and dropped from its end into a bin **39** for further treatment.

Following the halving process, the almond kernels to which moisture has been added by either the first or second method of restoring pliability, are suitably exposed to artificial heat, for example, on trays for a period of from 60 to 75 minutes at a temperature of from 130 to 140 degrees F., or on conveyors from 15 to 20 minutes at 200 degrees F., which may include using suitable infra-red lamps, the times and temperatures being approximate by way of example. This treatment is to remove the induced pliability by evaporating the moisture added to the kernels as above described, and thus restore the crunchy brittle characteristics.

Where the third method of restoring pliability is employed, that is, the subjecting of the whole dried almond kernels to heat, it is not necessary to again subject them to heat for drying them after halving, but rather it is only necessary to permit the halves to cool to normal temperature which removes induced pliability and restores the original crunchy, brittle characteristics.

The halved almonds are then passed over perforated screens to remove the small fragments and any imperfectly halved kernels, slivers and broken pieces, after which the finished product is packed in suitable containers.

Having described the invention, I claim:

1. In an apparatus for halving dried almond kernels having end roller supports for propelling a conveyor belt, a longitudinally movable conveyor belt mounted at its ends around said rollers, means for feeding almonds on the face of the conveyor flight of the belt with the natural planar seam of the almonds parallel to the plane of the belt, guide means longitudinally of the belt for aligning the so-positioned almonds with their longitudinal axes aligned with direction of movement of said conveyor flight of the belt,

a plurality of rotatable disc cutting knives relatively spaced transversely overlying the belt intermediate the ends of the guide means, the knives having their cutting edges centrally within the guide means, a yieldably resilient body having a face opposed to the cutting edges of the knives and adapted for yieldably holding the almonds against the cutting edge of the knives while they are being cut, the cutting edge of the knives penetrating into the opposed face of the yieldably resilient body.

2. An apparatus for halving dried almond kernels on the longitudinal axis thereof, comprising a longitudinally movable conveyor belt mounted at its opposite ends around rollers and having a yieldably resilient conveyor face, guide means longitudinally of the belt providing channels for guiding the almonds on the belt, means for feeding almonds at one end portion of the conveyor face of the belt with the length of the almonds aligned with the guide channels and the planar seam of the almonds parallel to the belt, and a row of relatively spaced rotary disc cutting knives transversely of the belt between the end rollers and each knife having its cutting edge centrally transversely of and within the length of a guide channel, the cutting edge of the knives penetrating the resilient face of the belt.

3. Apparatus of the character described, comprising a longitudinally movable conveyor belt, a guide means longitudinally of the belt, means for feeding almonds on the conveyor face of the belt within the guide means and including aligning members adapted for positioning almonds with an oval exterior side face reposing on the belt and the longitudinal axis aligned with the direction of movement of the belt, the guide means providing channels for guiding the so-positioned almonds in movement by the belt, a row of relatively spaced rotatable disc cutting knives transversely overlying the belt, said knives having their cutting edges transversely centrally of and within the length of the guide channels, the apparatus including a yieldably resilient body opposed to the cutting edges of the knives and adapted for supporting the almonds against the edge of the knives while they are being cut, the cutting edges of the knives penetrating into the opposed face of said yieldably resilient body.

4. In an apparatus for halving dried almond kernels lengthwise in a plane substantially perpendicular to the natural planar seam, a longitudinally movable conveyor belt mounted on opposite end rollers, said belt having a yieldably resilient conveyor face, means for feeding almonds to one end portion of the conveyor face of the belt, said feed means including means to align the almonds lengthwise with direction of movement of said conveyor face and with the natural planar seam parallel to the belt, guide means longitudinally of the belt for maintaining almonds arranged lengthwise on the belt, and a row of rotatable cutting knives transversely of the belt and intermediate the ends of the guide means, each knife having its cutting edge centrally of a guide means, said cutting edges penetrating into the conveyor face of the belt, whereby the almonds on the conveyor belt are severed lengthwise while within the guide means.

5. In an apparatus for halving almonds, a movable conveyor belt having a planar conveyor face, guide means longitudinally of the belt, means for feeding almonds on the belt within the guide means and adapted to position the almonds with the natural planar seam parallel to the belt and the longitudinal axes of the almonds aligned with the direction of movement of said conveyor face, a plurality of rotatable disc knives for cutting almonds so arranged on the belt, said knives being mounted on an arbor transversely of the belt and each knife having its cutting edge centrally of and within the length of a guide means, the planar conveyor face of the belt extending transversely across the cutting edges of said plurality of knives, and said apparatus including means for resiliently supporting almonds against the cutting edge of the knives while the almonds are being cut within the guide means.

6. An apparatus for treating shelled kernels of nuts comprising means for arranging nuts aligned in end to end relation in parallel rows, means for passing the arranged nuts longitudinally of the rows past a slitting position, and means for slitting the nuts entirely through the body thereof from end to end of the nuts by cutting contact therewith as the nuts pass said slitting position, whereby the nut bodies are severed into separate parts.

DAVID R. BAILEY.

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