Sept. 27, 1966 J. M. GUNN 3,275,049

APPARATUS FOR PRODUCING FIBROUS WAFERS OR FLAKES

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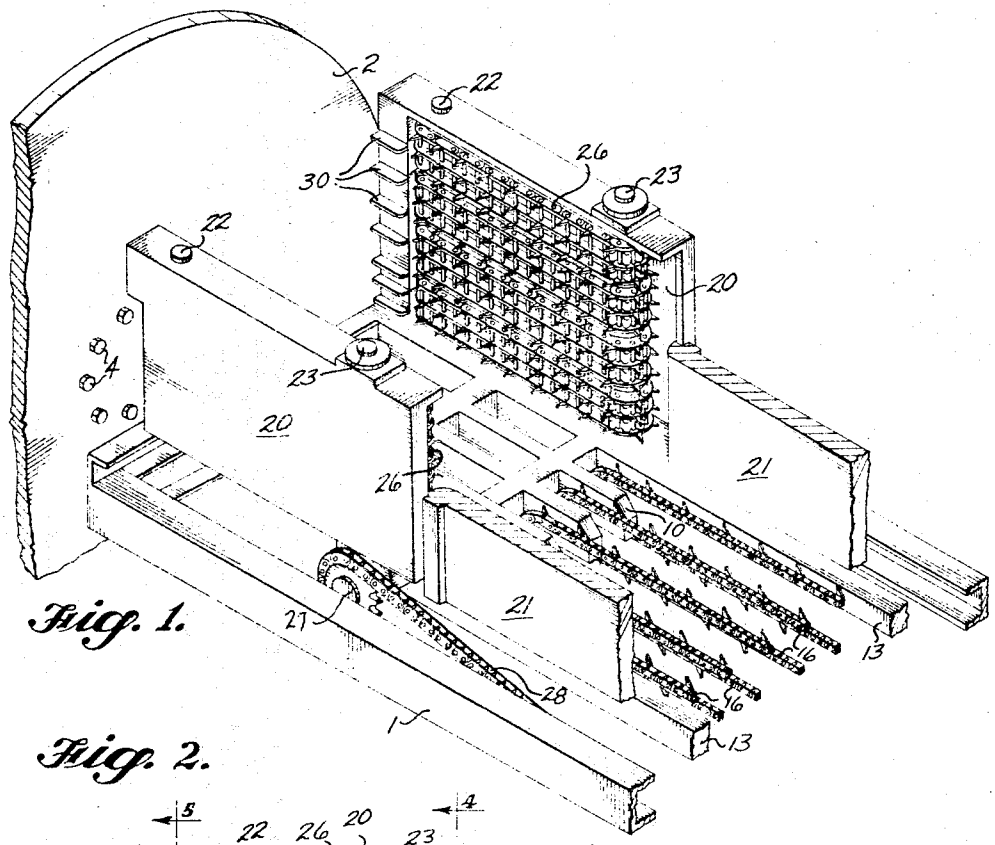
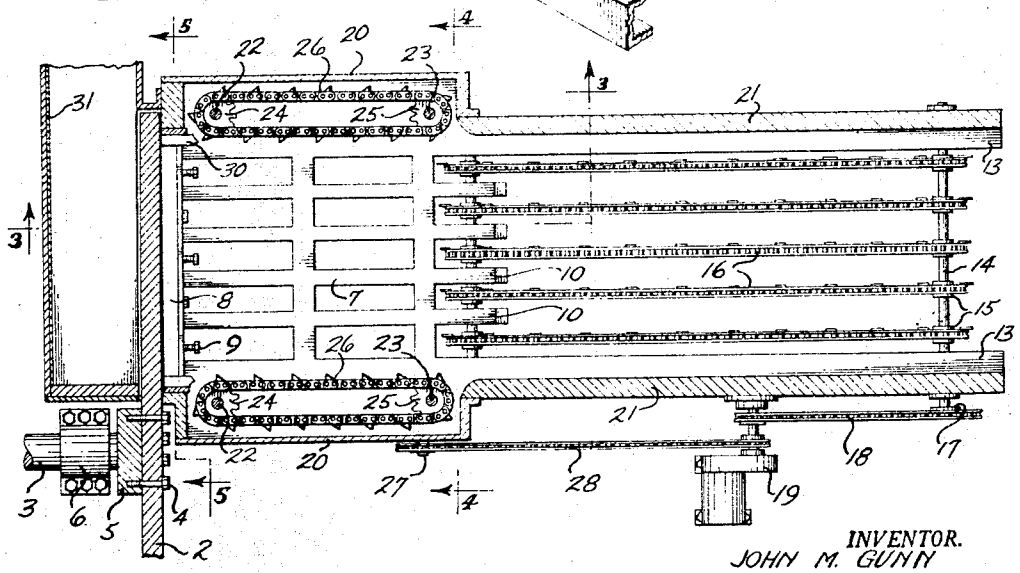


Fig. 1.

Fig. 2.



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Fig. 3.

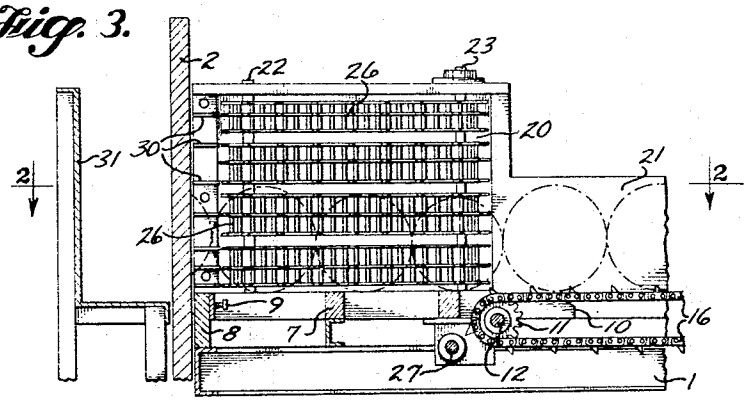


Fig. 4.

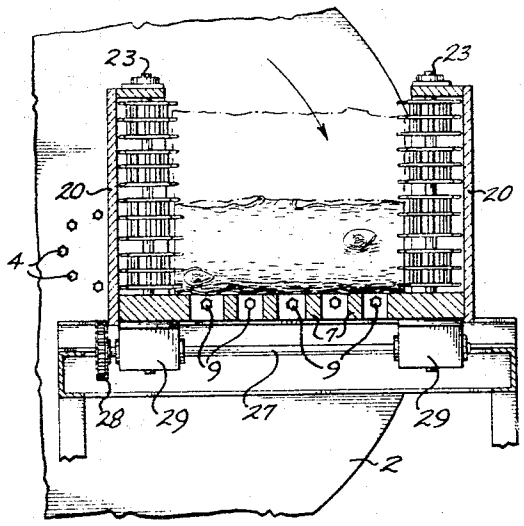
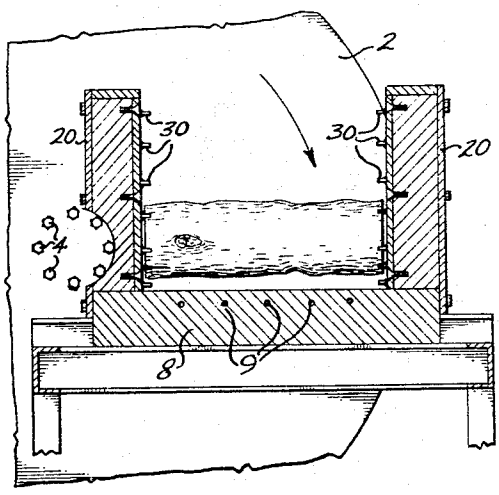


Fig. 5.



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Fig. 6.

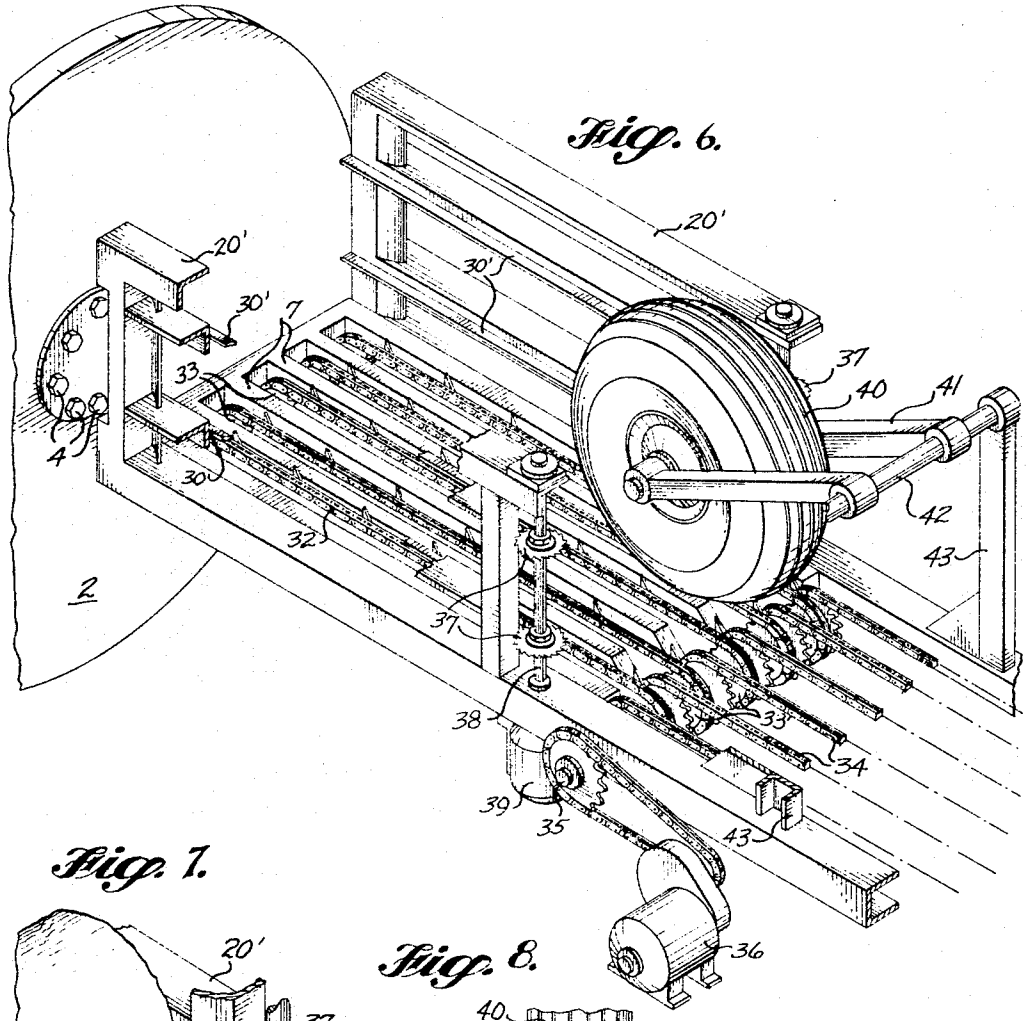


Fig. 7.

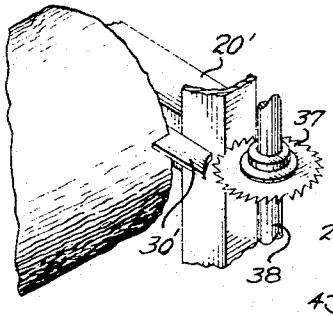
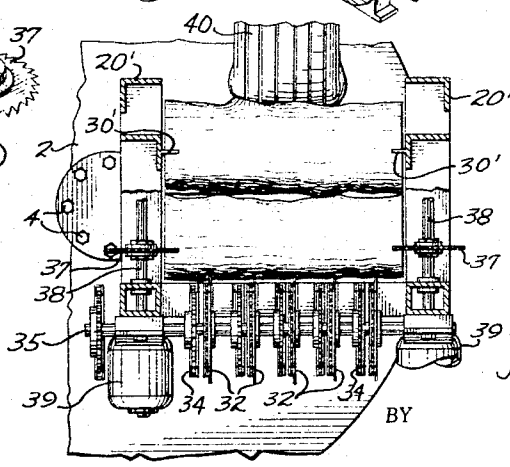


Fig. 8.



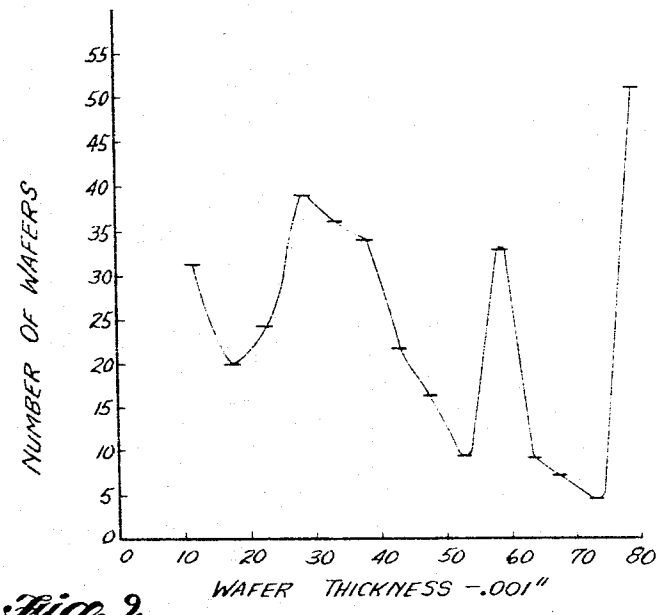
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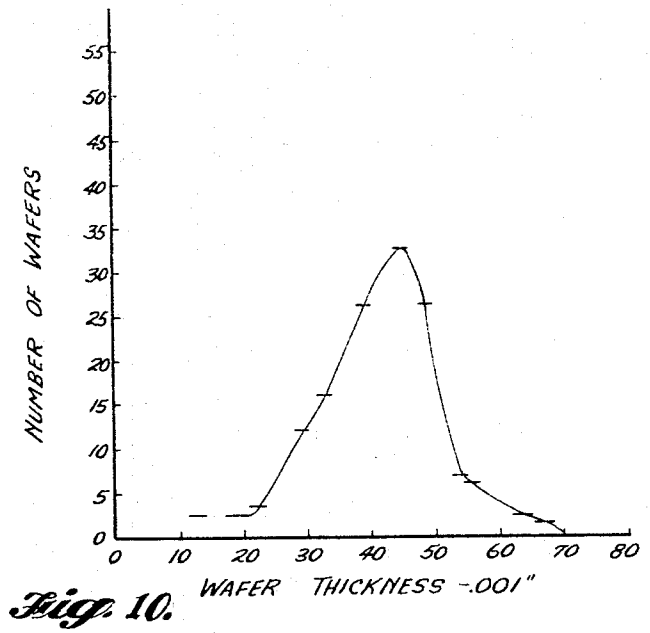
APPARATUS FOR PRODUCING FIBROUS WAFERS OR FLAKES

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DISTRIBUTION OF WAFERS BY THICKNESS - WITHOUT STABILIZERS. FEED RATE SET FOR 0.050" WAFERS

Fig. 9.



DISTRIBUTION OF WAFERS BY THICKNESS - WITH STABILIZERS FEED RATE SET FOR 0.050" WAFERS

Fig. 10.

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APPARATUS FOR PRODUCING FIBROUS WAFERS OR FLAKES

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Continuation of application Ser. No. 203,245, June 18, 1962. This application Jan. 25, 1965, Ser. No. 427,676
1 Claim. (Cl. 144—176)

This application is a continuation of my application Serial No. 203,245 filed June 18, 1962, for apparatus for producing fibrous wafers or flakes, now abandoned. This invention relates to an apparatus for the production of wooden wafers or flakes for use in the manufacture of sheets, and more particularly to improvements in the feed mechanism for such apparatus.

It is well known in the art of producing sheets from flake material that the flaking or waferizing operation should be carefully controlled to produce flakes or wafers of uniform dimensions. If the size of the flakes or wafers varies widely, a conglomerate product results which varies in strength and density from part to part and is characterized by surface defects resulting from the inclusion of sticks and slivers. Uniform thickness flakes of maximum practical thickness are most effective in conversing glue required to bond them together.

It is difficult to feed wood pieces at a uniform rate and to hold them in a constant relationship to the cutterhead of a flaker during cutting. The wood has an increased tendency to splinter during cutting of the last portion of each piece because of lack of proper support. The uniformity of thickness of the flakes or wafers produced depends upon the setting of the knives, the rate of feed, the number of knife strokes per time unit, and the proper support of the piece of wood from which the flakes are to be cut, all of which must be carefully controlled to produce uniform flakes.

It is therefore a primary object of the present invention to provide an apparatus which will produce a mass of wafers or flakes from wood which are substantially of a predetermined thickness, and which is quite free from sticks and slivers. The provision of an improved feeding device which firmly holds the piece of wood being processed until it is completely reduced to flakes contributes principally to attaining this object.

Another object of the present invention is to provide an apparatus which will hold securely pieces of wood of different sizes and shapes during the cutting operation, for producing from them flakes all of substantially the same thickness.

Briefly described, the apparatus used for the production of the wafers or flakes includes a rotating cutterhead, which may be a disk or cylinder, having projecting knives. A port beneath each knife receives the flakes or wafers cut by the knives. Feed mechanism may be composed of a bed having two upright spaced sides incorporating guide feed means for feeding wood pieces to the rotating cutterhead. The guide means are associated with the sides spaced transversely of the bed. The feed means may be endless traveling feed chains at the sides moving in horizontal planes and having lugs or teeth engageable with the ends of the wood pieces to be fed to the cutter head, or the feed means may be on the bed. If the chains are at the sides they are synchronized to move opposite ends of the wood at equal speeds toward the cutterhead. Associated with the feed means are positive guide means engaged with the ends of the wood pieces, particularly as they are being cut, to maintain the attitude of each wood piece to the cutter unchanged throughout the entire operation of cutting up that piece of wood into flakes.

The feeding chains have lugs or teeth to engage the ends or sides of logs or slabs positively. At least by the time the piece approaches the cutterhead its opposite ends are engaged by blades in planes parallel to the direction of piece movement. As the cutting progresses the lugs on the feed chains release as they rotate about their sprockets, and movement of the piece is continued by pushing of a piece behind it. To maintain travel of the piece in the same path, the guide blades engage grooves in the opposite ends of the piece as it is urged forward by the next log until it is completely reduced to flakes or wafers.

FIGURE 1 is a top perspective of a flake cutting machine, showing one type of feed and guide mechanism. FIGURE 2 is a horizontal section of such machine taken on line 2—2 of FIGURE 3, and FIGURE 3 is a vertical section through a portion of the machine on line 3—3 of FIGURE 2. FIGURE 4 is a transverse vertical section through the machine on line 4—4 of FIGURE 2, and FIGURE 5 is a different transverse vertical section on line 5—5 of FIGURE 2.

FIGURE 6 is a top perspective of an alternate form of machine, with parts broken away. FIGURE 7 is a perspective detail of a portion of the machine, and FIGURE 8 is a transverse vertical section through the machine.

FIGURES 9 and 10 are graphs illustrating comparative performance of a conventional machine and one embodying the present invention.

The illustrated wood waferizer or flaker has a cutting head mounted on the frame **1**. Although the cutterhead may be any suitable reciprocating or rotary cutter carrying a flake-cutting knife, it is shown as a rotary cutting disk **2**. The cutting disk is mounted on a shaft **3** by bolts **4** extending through the disk into a flange **5** on one end of the shaft. The shaft is carried by the frame in a bearing **6**. Horizontally located on the frame is a work-supporting bed **7** having one end adjacent to the rotary cutting disk **2** and extending perpendicularly away from the face of the disk. The width of the bed is somewhat less than the radius of the cutting disk, and the bed is horizontally offset from the center of the disk so that rotation of the disk will move knives mounted radially on the disk downward past the wood piece.

Between the disk and the bed **7** is a soft metal insert **8** which may be adjusted by bolts **9** to secure the proper clearance between the bed and the rotating cutting disk **2**. These adjustment bolts are located in the lightening holes of the bed. At the opposite end of the bed from the insert **8** are projections **10** spaced apart to receive between them idler sprockets **11** secured to shaft **12** which is journaled in the projections. The sprockets are of a size and so positioned that the upper portions of their peripheries are flush with or slightly higher than the top of the bed.

Two side bars **13** extend from the end of the bed **7** remote from the rotary cutterhead beyond the ends of the projections **10**. Remote from the bed **7** these side bars carry a shaft **14** which is parallel to shaft **12**. Sprockets **15**, similar to sprockets **11**, are keyed or otherwise secured on this shaft respectively in alignment with the idler sprockets **11**. Roller chains **16** are mounted on the sprockets **11** and **15** and between the side bars **13**. To one end of shaft **14** drive sprocket **17** is securely keyed and receives a driving chain **18** by suitable drive mechanism **19**. The feed chains **16** are thus located to feed pieces of wood to the bed **7**, with their lengths extending transversely of the direction of feed movement toward the cutting disk **2**.

In order to retain the pieces of wood certainly on the feed chains **16** and bed **7** of the flake cutting machine, side walls **20** at opposite sides of the bed **7** and side walls

21 at opposite sides of the section of feed chains are provided, which are of a height to retain a stack of pieces to the maximum height capable of being fed properly for cutting by the cutter disk 2. In the form of device shown in FIGURES 1 to 5 inclusive no provision is made on the bed 7 for effecting movement of the wood pieces toward the cutting disk. While the chains 16 would crowd toward the cutting disk, pieces between such chains and the cutting disk, it is important that the pieces near the cutting disk be fed positively. Also where the pieces are of generally cylindrical shape, as logs are, application of moving force to the lower sides of pieces does not provide stability against rolling for them.

To effect positive movement of the wood pieces adjacent to the cutting disk 2, therefore, end-engaging feed means are provided at opposite sides of the bed 7 and alongside the upright walls 20. Adjacent to the cutting disk are upright shafts 22 journaled in the walls 20, and at locations remote from the cutting disk and adjacent to the ends of feed chains 16 closer to the cutting disk are upright shafts 23. The shafts 22 carry sprockets 24 spaced vertically along them, and shafts 23 carry sprockets 25 spaced vertically along them, corresponding to the spacing of sprockets 24. Workpiece end-engaging chains 26 encircle the pairs of sprockets 24 and 25 so as to provide opposite moving feed walls. The chains 26 have lugs spaced along them at intervals which are equal in the various chains, and the lugs of the several chains are preferably disposed in registry in vertical lines, as shown best in FIGURE 1.

The upright banks of chains are located as close as practical to the cutting disk 2 so as to hold the workpieces firmly as flakes of wood are cut from them by the rotating disk. Also these feed chain banks are driven in synchronism with the feed chains 16 by a drive shaft 27 connected by suitable bevel gearing 29 to the shafts 23, the shaft 27 in turn being driven by a chain 28 connected to the slow speed drive 19 which drives the feed chains 16. The chains 26 cannot extend clear to the face of the cutting disk 2, however, because of the necessity of supporting such chains on sprockets of substantial radius, particularly where the workpieces are logs. It is therefore difficult to support them in constant attitude to the cutting disk, especially after the cutting has progressed beyond he vertical diametral plane of the log. The particular concern of the present invention is to provide supporting and guiding means which will maintain a constant relationship between a workpiece and the cutting disk until its cutting into flakes has been substantially completed.

The problem is illustrated in FIGURE 3, where a procession of logs is illustrated in phantom lines as being supported in abutting relationship by the feed chains 16 and the bed 7. The workpieces are shown as being crowded together, and the workpiece at the left in engagement with the cutting disk 2 is shown as having been cut to a piece of segmental cross section less than a semicircle, so that the bottom of this workpiece portion no longer rests on the bed 7, and it has been moved to the left beyond the end of feed chains 26. While this workpiece remnant is shown in position elevated above the bed 7, if there were no provision made for maintaining a constant attitude between the workpiece and the cutting disk 2, such remnant would have dropped onto the bed 7 and would be caught under the next cylindrical workpiece which would tend to crowd the upper edge of the remnant against the cutting disk so as to tilt the disk-engaged face of the remnant and prevent uniform slices from being cut off the workpiece by the cutting disk.

The supporting and guiding structure for remnants of workpieces includes blades 30, shown in FIGURES 1 to 5, inclusive, at opposite sides of the feed path which are arranged respectively in horizontal planes in horizontal alignment with the rows of workpiece-engaging lugs on the end-engaging chains 26. Each of these blades is supported on the wall 20 in a position projecting so that its outer edge is substantially in alignment with the points of the lugs on the corresponding stretch of chain 26. The length parallel to the direction of travel of the workpieces should be from a location immediately adjacent or in close proximity to the cutting path of disk 2 to a location adjacent to the path of travel of the chain lugs. The width of each blade transversely of the direction of travel of the workpieces should be at least as great as the length of each chain lug which projects from the chain.

As each workpiece is moved from the feed chains 16 between the opposite banks of end-engaging feed chains 26 the lugs of such feed chains will be pressed into the end grain of the workpieces if they are of a length substantially equal to the spacing between the bodies of the chains 26 proper. Thus the end of each workpiece will have in it one or more rows of indentations corresponding to the lines of lugs on chains 26. As each workpiece is moved by the chains 26 into registry with the blades 30, such blades will slice grooves in opposite ends of the workpiece along the line of perforations produced by the lugs of chains 26. For that purpose the ends of the blades remote from the cutting disk 2 preferably are sharpened to facilitate such slicing action.

As the workpiece is pushed farther towards the cutting disk its opposite ends will thus be impaled by the blades to prevent the workpiece from tilting. Also the blades, which extend into close proximity to the cutting disk 2 as shown in FIGURES 2 and 3, will actually support the workpiece by its opposite ends so that it will retain the position indicated at the left of FIGURE 3 until it has all been cut up without requiring to be supported on the bed 7. When the workpiece has reached the position shown in FIGURE 3 it will no longer be pushed against the disk 2 directly by the banks of feed chains 26, but such remnant will be moved by the pushing action of the following workpiece which is engaged by the feed chains. The contact between the two workpieces will remain the same as prior to movement of the remnant beyond the feed chains because of the supporting and guiding function provided by the blades 30.

As the workpieces are thus forced against the cutting disk 2 the knives carried by such disk will slice flakes from the face of the workpiece next to the cutting disk, which will pass through the disk into the collecting trough 31 shown in FIGURES 2 and 3, which will remove the flakes. It has been found that the use of the supporting and guiding blades engaged with the opposite ends of the workpieces preserves the uniformity of cutting action by the disk until the workpiece is substantially entirely consumed. Such uniformity of flake or wafer thickness is very desirable, and the improvement in such uniformity is indicated by a comparison of FIGURES 9 and 10. FIGURE 9 indicates the nonunimormity of wafer or flake thickness found in samples cut by a flaking machine which was not equipped with the supporting and guiding blades of the present invention when the machine was set to cut wafers of 0.050 of an inch in thickness. In the particular sampling, which was representative, while the average thickness was about 0.050 of an inch, there were many thick wafers or flakes and many thin wafers or flakes. By contrast, the graph of FIGURE 10 shows that where the blade stabilizers 30 were used there were very few thick and thin wafers or flakes.

A modified form of workpiece end supporting and guiding arrangement is shown in FIGURES 6, 7 and 8. In this instance the workpieces are moved clear to the cutting disk 2 by chains beneath the workpieces mounted on the bed 7. Such chains 32 have upwardly projecting work-engaging lugs and are carried by sprockets 33 and 33'. Chains 34 carry the workpieces to the feed chains 32. Movement of the chains 32 and 34 is coordinated by mounting the sprockets for driving both sets of chains on the single shaft 35, which is rotated by the drive motor mechanism 36. With this type of

feed arrangement it is even more important to provide workpiece end-engaging supporting and guide mechanism, because in this apparatus there is no positive feed mechanism engaging the opposite ends of each workpiece.

In this instance the feed mechanism would not push a workpiece positively against slicing blades, and consequently grooves are cut in opposite ends of each workpiece to receive the supporting and guiding blades **30'** disposed at opposite sides of the work feed mechanism and extending into close proximity to the cutting face of the cutterhead disk **2**. Such grooves are formed by small saws or milling cutters **37** which are mounted on drive shafts **38** at opposite sides of the feed mechanism. Such grooving saws or cutters are spaced apart lengthwise of the shafts and located thereon in positions corresponding to the spacing and locations of the blades **30'**. Also the diameter of such cutters and the locations of the shafts **38** are such that the grooves formed by them will be of depths substantially corresponding to the spacing of the blades **30'** across the feed path.

Preferably, as shown in FIGURE 8, each of the grooving cutter mounting shafts **38** will be driven by a separate motor **39**. During the procedure of cutting the grooves in the ends of the workpieces by such cutters the workpieces will be held down firmly against the feed chains **32** by suitable yieldable hold-down mechanism which may be in the form of a pneumatic tired wheel **40**, shown in FIGURES 6 and 8 as being mounted for upward and downward movement on the swinging ends of arms **41**, which are pivoted above the axis of a shaft **42** and such shaft may be rotatable in the upright supports **43** or such shaft may be stationary and the arms **41** swingably mounted on it. In either case the weight of the wheel **40** will be sufficiently great to apply adequate pressure to the workpieces, as shown in FIGURE 8, and the length of arms **41** will be sufficient to provide an adequate range of up-and-down movement for the hold-down wheel to accommodate either a single layer of workpieces or a plurality of layers of a height approximately equal to the height of the sides **20'** for the work feed trough.

As the workpieces are moved by the feed chains **32** from the supply chains **34** toward the cutter disk **2**, and while being held down by the wheel **40**, they will be transported past the end-grooving cutters **37**, which will cut grooves in their opposite ends at locations corresponding to the supporting and guiding blades **30'**. As the workpieces continue to be moved toward the cutting disk by the feed chains **32** from the grooving cutters, as indicated in FIGURE 7, the grooves will embrace the supporting and guiding blades **30'**, which will impale the ends of the workpieces to support and guide them against dropping, tilting or sluing until virtually the entire workpiece in each instance has been cut into flakes or wafers by the rotating disk **2**.

I claim as my invention:

A wood flake-cutting machine comprising a continuously-rotating flake-cutting cutterhead carrying a flake-cutting knife, generally horizontal channel-shaped means defining a work feed passage extending into a position closely adjacent to said cutterhead, constantly-rotating feed chain sprockets supported at the end of said channel-shaped means adjacent to said cutterhead, feed chains extending along the bottom of said work feed passage, engaged with said feed chain sprockets and engageable with curved-side workpieces in such work feed passage, each having the length of its grain extending transversely of such work feed passage and a curved side downward, to move said workpieces transversely of their lengths along such passage, work-supporting and guiding blades at opposite upright sides of the work feed passage, disposed in substantially horizontal planes parallel to the work feed passage and extending between the location of said feed chain sprockets in the work feed passage and said cutterhead and into close proximity to the cutting path of said cutterhead knife, engageable simultaneously with opposite ends, respectively, of each workpiece for supporting such workiece independently of the bottom of the work feed passage and guiding such blade-engaged workpiece for substantially linear movement along the work feed passage to said cutterhead in a constant attitude relative to said cutterhead until virtually the entire workpiece has been cut into flakes, rotary-disk grooving cutters at opposite sides of the work feed passage located in advance of said blades along such passage and spaced from the bottom of the work feed passage corresponding to the spacing of said blades from the bottom of such passage, and hold-down means adjacent to said grooving cutters operable to hold a workpiece down in contact with said feed chains.

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