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CYLINDRICAL CUTTER HEAD HAVING MULTI-DRUM
AXIALLY ALIGNED SECTIONS WITH
ANGULARLY DISPOSED BLADES
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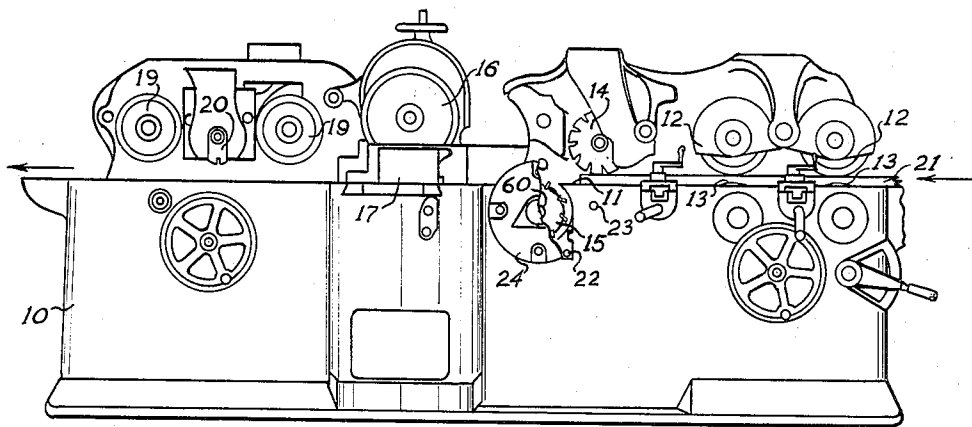


Fig. 1

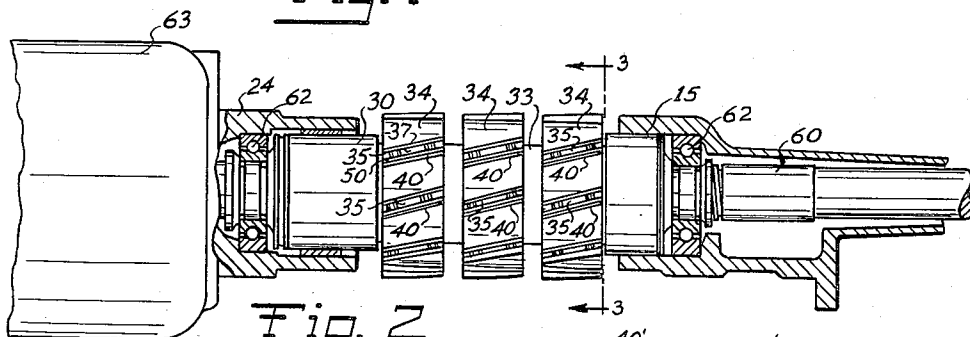


Fig. 2

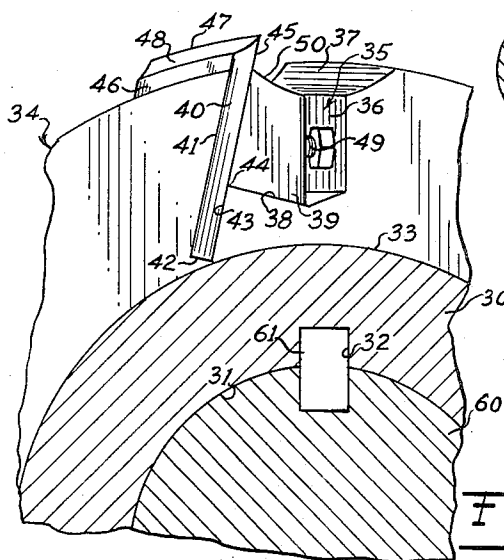


Fig. 3

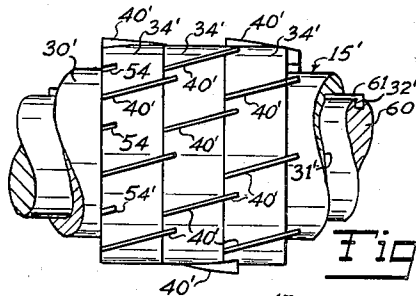


Fig. 4

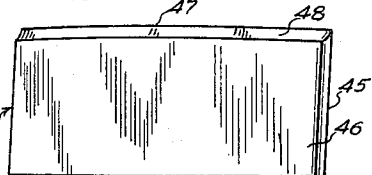


Fig. 5

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CYLINDRICAL CUTTER HEAD HAVING MULTI-DRUM AXIALLY ALIGNED SECTIONS WITH ANGULARLY DISPOSED BLADES

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This invention relates to a wood planing machine and is more particularly concerned with a cylindrical cutter head having multi-drum axially aligned sections with angularly disposed blades.

In the past wood planing machines have been extensively used for finishing one or several surfaces of a board. Such machines have usually employed cutter heads in which the cutter blades are spaced around the periphery of the cutter head and each is aligned with the axis of rotation of the cutter head. The shaft carrying the cutter head in these prior art machines has usually been positioned normal to the path of travel of the board or plank through the machine. Recently, however, U.S. Patent No. 2,725,048 has been granted in which the shaft is shown as being disposed at an angle with respect to the path of travel of the board. The blades, however, are still aligned with the axis of rotation of the cutter head.

In such prior art machines, the entire cutting edge of each successive blade simultaneously engages the surface of the wood and there is therefore a tendency to hammer the board, creating a wave like surface on the board, causing excessive difficulty in the final finishing of the wood. Also, with such prior art machines there is a tendency to tear slithers of wood from the surface of the board which causes them to be of little value for cross-grain planing.

When such prior art machines are employed for planing hard wood, such as oak flooring, the knots along the surface of the board are particularly difficult to plane since there is some cross-grain present in each knot. Also, the knots, after the board has been dried, may be loosely held by the board; therefore, the hammering and tearing effect of the prior art machines tends to dislodge the knot and provide a lower grade finished product. Furthermore, the surface surrounding the knot tends to have a poor finish.

Another factor in the use of the prior art machines, which is of vital importance to a lumber mill, is the fact that, with continued use, the blades of the prior art machines will remain sharp only a very short period of time; and, when the blades become dull, the machine must be shut down and dismantled to remove the blades for sharpening. This must be done almost daily. When the sharpened blades are returned to the prior art machine, they must each be positioned with care so that the cutting edge of each blade not only lies parallel to the axis of rotation of the cutter head but each edge must be the same distance from the axis of rotation as all other blades around the periphery. Thus it is seen that a skilled mechanic must be employed to sharpen the blades of the cutter head, and care must be exercised in returning the blade to the cutter head after the blade has been sharpened. Usually even when care is exercised in sharpening and installing the blades on the cutter head, certain edges of the blades protrude radially beyond others, therefore it is necessary to joint off a portion of the high blade or blades.

It is therefore seen that very substantial savings could

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be effected if the length of time that a cutter head may be employed without requiring resharpening of its blades were increased.

With the entire cutting length of the blade striking the board at the same time as is done by prior art machines, a great deal of heat is generated in the blades. The heating of the blade tends to promote its becoming dull more quickly.

With these problems in mind, I have devised a planing machine in which the cutter head is provided with angularly disposed blades having slightly convex cutting edges. These blades are spaced around the periphery of the blade supporting drum of the cutter head, and the cutter head is provided with several such drums, co-axially aligned so that when relatively narrow boards, such as oak flooring, are planed, any one of the drums may be positioned for planing engagement with the boards, as the remaining drums rotate with the working drum free of engagement with the boards. Because of the space between the drums, substantially no heat is transferred from drum to drum; hence, when one drum has become overheated, an alternate drum may be easily and quickly positioned for planing action in its stead. With the angular disposition of the blades and their convex cutting edges, only a fraction of each blade engages the surface of the board, thereby tending to slice transversely of the board as the board passes over the rotating cutter head. With such a cutting arrangement, the cutter head remains in usable condition for days, rather than hours, and produces a superior planed surface on the board, employing a fraction of the horsepower previously used.

In a modified form of my invention, I have devised a cutter head for relatively wide boards in which the relatively short blades are staggered and the ends of these convex blades overlap one another, the blades being spaced radially around the drum or drums.

Accordingly, it is an object of the present invention to provide in a wood planing machine a cutter head which will produce a superior planed surface on wood.

Another object of my invention is to provide in a wood planing machine a cutter head which will operate for substantial periods of time without the necessity of having the blades thereof resharpened.

Another object of my invention is to provide in a wood planing machine a cutter head wherein progressively different portions of the edge of each blade of the cutter head engage the wood being planed.

Another object of my invention is to provide in a wood planing machine a cutter head in which the blades thereof tend to slice along the wood being planed.

Another object of my invention is to provide in a wood planing machine a cutter head in which the blades thereof remain relatively cool during the normal planing operation.

Another object of my invention is to provide in a wood planing machine a cutter head which is efficient in operation, inexpensive to maintain and durable in structure.

Other and further objects, features and advantages of the present invention will become apparent from the following description when taken in conjunction with the accompanying drawings wherein like characters of reference designate corresponding parts throughout the several views and wherein:

Fig. 1 is a partially broken away side elevational view of a wood planing machine having a cutter head constructed in accordance with the present invention.

Fig. 2 is a partially broken away vertical sectional view of the cutter head assembly including driving motor and cutter head of the machine shown in Fig. 1.

Fig. 3 is an enlarged cross sectional fragmentary view taken along line 3—3 in Fig. 2 and showing a drum of the cutter head.

Fig. 4 is a side elevational view of a modified form of the cutter head of the present invention, suitable for planing relatively wide boards.

Fig. 5 is a perspective view of a blade suitable for use in the cutter heads shown in Figs. 2, 3 and 4.

Referring now in detail to the embodiment chosen for the purpose of illustrating the present invention, it being understood, however, that the invention in its broad aspects is not limited to the exact details here depicted, numeral 10 denotes generally the base or frame of a conventional planing machine having a platen or bed 11 over which the boards travel in the direction of the arrows in Fig. 1.

This conventional planing machine or jointer, as it is sometimes termed, includes the usual opposed infeed rolls, such as top rolls 12 and bottom rolls 13. These infeed rolls 12 and 13 serve to feed the boards, such as oak flooring material, into the machine, end to end, where the boards are successively shaped into a final product having a relatively uniform cross section. To accomplish this, the boards are fed by rolls 12 and 13 along platen 11, beneath a back surface planing drum 14 spaced above the platen and thence to the cutter head, denoted generally by numeral 15. The upper periphery of the cutter head 15 projects up through a slot in platen 11 and the boards are urged against the blades of cutter head 15 by the back surface planing drum 14. By action of the planing drum 14 and the cutter head 15, successive boards are reduced to a uniform thickness.

Next, the successive boards travel between the opposed blades of the edger 17 arranged after the cutter head 15 adjacent platen 11. The blades of the edgers 17 cut the usual tongue and groove into the boards and reduce the boards to a uniform width. While passing between the blades of the edger 17, each board is urged against the platen 11 by a presser roll 16. Thence the boards, being carried by the outfeed rolls 19, are fed beneath the usual hollow back cutter 20 where concaved grooves are cut into the back surface of the boards.

The usual guides, such as guide 21, are provided in such machines together with suitable adjustment means for raising and lowering the various cutting elements with reference to platen 11. Also, there are the customary means for positioning and aligning the successive boards in their travel through the machine. Of particular interest, however, in the present application is the horizontal adjustment means, such as worm screw 22, and the horizontal adjustment lock 23. When the horizontal adjustment lock 23 is loosened, the cutter head assembly including cutter head housing 24 may be moved transversely of the frame 10 by means of the horizontal adjustment means 22.

A better understanding of the conventional machine described above may be had by reference to the "Service Bulletin for Type A23 Floor Matcher" published by Yates—American Machine Co., Beloit, Wisconsin, which is made a part of this application by reference thereto.

According to the present invention, the new and novel wood cutter head 15, as best seen in Figs. 2 and 4, is substituted for the conventional cutter head found in such machines. My cutter head 15 includes a right cylindrical body drum 30 which has an axial cylindrical bore 31 provided with a kerf 32. The central portion of the drum is of reduced diameter to provide a peripheral recess 33, circumferentially around which are a plurality of axially spaced, concentrically mounted, coaxially aligned, blade carrying drums 34. Each of drums 34 is identical in construction, being formed integrally with body drum 30.

Recessed in the outer periphery of each of drums 34 is a plurality of preferably from about eight to ten evenly spaced angularly related gib and blade receiving cavities 35. Since each cavity 35 is identical in all drums 34, only one such cavity 35 is illustrated in detail in Fig. 3. The cavity 35 in Fig. 3 is defined by a flat front wall 36 angling at about 15° from the axis of rotation of drum

34. The outer edge of wall 36 terminates below the periphery of the blade carrying drum 34. From the outer edge of wall 36, the drum 34 is concaved, as at numeral 37, to define a recessed portion for temporarily receiving the wood shavings as they are removed by the blade from the surface of the board. This wall section 37 terminates at the periphery of the drum 34. The bottom wall, defining the gib and blade receiving cavity 35, includes a pair of merging surfaces, the rear gib receiving surface 38 of which angles outwardly to provide an abutment for the bottom surface of the gib 39.

It will be observed in Fig. 3 that the gib and blade receiving cavity 35 includes a blade receiving recess shaped to receive one of the blades 40. The blade receiving recess is deeper than the gib portion of cavity 35 and is defined by a rear wall 41, a bottom surface 42 and a front wall 43. The front wall 43 and the gib receiving surface have a common edge 44. The rear wall 41 and front wall 43 of the blade receiving recess are essentially parallel and are inclined with respect to the radius of the drum 34 to hold blade 40 in a forwardly tilted position, as shown in Fig. 3. The front and rear walls 43 and 41 are also at an angle of about 15° with respect to the axis of rotation of drum 34.

When the blade 40 is inserted in the blade receiving recess, the bottom edge of the blade rests on bottom surface 42, the lower portion of front surface 45 of blade 40 being adjacent wall 43 while substantially all of its back surface 46 rests upon the rear wall 41. It will be noted that the outer or upper portion of blade 40 protrudes above the outer periphery of drum 34 and is provided with a convex cutting edge 47 formed by the forward surface 45 and the bevelled upper surface 48 of blade 40.

The blade 40 is locked in position by a block known as gib 39, the rear surface of which is urged against an intermediate portion of surface 45 by means of a plurality of spaced gib bolts, such as bolt 49. For accomplishing this, each of the gib bolts is threadedly carried by the gib 39 and protrudes from the front surface of gib 39 so that the hexagonal head of each gib bolt 49 may engage front wall 36. Rotation in one direction of the gib bolts, such as bolt 49, therefore urges the gib 39 against the blade 40 and reverse rotation will reduce the distance between the head of bolt and the rearmost surface of the gib so that the blade 40 may be removed from its recess.

The upper surface of the gib 39 is concaved along the same arc as is surface 37. It is therefore seen that as the blade 40 cuts the wood which the planing machine is planing, the chips or shavings therefrom will be temporarily received in the concavity defined by surfaces 37 and 50.

From an examination of Fig. 2, it will be observed that all the blades 40 are arranged at an acute angle of from about 5° to about 35° with respect to the axis of its drum 34, the optimum angle being about 15°. It is important that the edge 47 of blade 40 be always sharpened so as to provide an edge having an arc which is concentric with the drum 34. Thus, the blade 40, as installed, has an edge 47 which is convexed in such a way that the points of the locus of edge 47 are equidistant from the axis of rotation of the drum 34.

In the present embodiment of the invention as illustrated in Figs. 1, 2, 3 and 5, the body drum 30 has a major diameter of 3½ inches and a minor diameter of 3¼ inches. Each of drums 34 has a diameter of 7½ inches and a width of 2¾ inches with a space between adjacent drums 34 of 15/16 inch. Each of blades 40 is 22½/32 inches wide, so that when arranged at a 15° angle, they about fit the blade receiving recess.

As seen in Fig. 2, the body drum 30 is received on a drum rotating shaft 60 and is keyed thereto by a key 61, carried in kerf 32 as seen in Fig. 3. The shaft 60 is carried by ball bearings 62 in housing 24 and is driven by a motor 63 also mounted on housing 24. It is pref-

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erable that the shaft 60 be arranged normal to platen 11 and therefore normal to the path of travel of the boards across platen 11.

In Fig. 4 is shown a modified form of the present invention. The cutter head 15' of this modification may be substituted for the cutter head 15 on shaft 60. Cutter head 15' includes a body drum 30' provided with a bore 31' and a kerf 32' which receives the key 61 of shaft 60. The body drum 30' is of uniform diameter throughout its length and carries a plurality of abutting, removable blade carrying drums 34', each identical in construction to the others. The drums 34' are identical with drums 34 except that drums 34' are not integral with but are removably fixed to their body drum 30' and each is provided with blade pockets 54. The blades 40' of drums 34' are clamped in place in cavities in drum 31' in a manner similar to the clamping of blades 40 in place by gibs 39. Thus, no cavities, gibs and gib bolts are illustrated in Fig. 4.

It will be observed in Fig. 4 that blades 40' are longer than the blades 40 and hence, a portion of each blade 40' protrudes beyond one edge of its drum 34' so as to overlap the next adjacent drum 34' and be received within one of pockets 54 of that next drum 34'. Therefore with the blades 40' in place in the respective drums 34', the drums 34' will be essentially interlocked so that the blades 40' in one of the drums 34' overlap the blades 40' of the adjacent one drum of drums 34' and the blades 40' of this adjacent drum 34' overlaps the blades 40' of the next adjacent drum 34'.

Each of the blades 40' is provided with a convex cutting edge similar to edge 47 and so ground as to be concentric, when mounted in the drums 34'.

Thus, when the drums 34' are rotated by shaft 60, the staggered arrangement of the blades 40' provides for the cutting edge of the blades 40' of the rightmost drum 34' to slice progressively from right to left along the board to be planed, and immediately prior to the time a particular blade 40' completes its cut, the blade 40' of the middle drum 34' commences its cut from right to left, etc.

If desired, a drum 30 or 30' may be substituted for the planing drum 14.

Operation

From the foregoing description, the operation of the present invention should be apparent.

With the cutter head 15 in place on shaft 60, the lock 23 is rotated so that the cutter head housing 24 is free for transverse movement. Then the worm screw 22 is manipulated so as to move housing 24 until one of the blade carrying drums 34 is positioned in alignment with a board positioned on platen 11. Thereafter, the lock 23 is tightened.

Next the motor 63 is energized to rotate the drums 34 in a direction such that the upper periphery of drum 34 rotates in a direction opposite the direction of travel of the boards along platen 11. In other words, the cutter head 15 as viewed in Fig. 1 is caused to rotate in a clockwise direction.

Also, the motor or motors (not shown) are energized to rotate the planing drum 14 in a counterclockwise direction, the bottom rolls 13 in a counterclockwise direction and the outfeed rolls 19 in a clockwise direction. The hollow back cutter 20 and the blades of the edger 17 are also caused to rotate in their usual manner, as will be understood by those skilled in the art. The boards to be planed are then successively, in end-to-end fashion, fed to the infeed rolls 12 and 13 and thence along platen 11, being guided therealong by guides such as 21. In their travel along platen 11, the boards first pass beneath the back surface of planing drum 14 where the blades along the lower periphery of drum 14 plane the bottom surface of the board, and then over the cutter head 15. Thence the boards pass between the edger 17 and are carried by the outfeed rolls 19 beneath the hollow back cutter

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20, thereafter to be discharged from the machine as uniform or matched flooring. In this process, the bottom surface of the board was planed by rotating drum 14, the upper surface of the board was planed by the blades 40 of cutter head 15 and the tongue and grooved edges were formed by the edger 17.

As each successive board passes above the cutter head 15, the leading or right hand edge portion (as viewed in Fig. 2) of each successive blade 40 is first to engage a complementary portion of the surface of the board and thereafter, continued rotation of drum 34 causes progressively varying transverse portions of the board. As this blade 40 completes its cut, the next blade 40 begins its cut from right to left as viewed in Fig. 2, etc.

It is therefore seen that even though shaft 60 is arranged transversely of the line of travel of the boards along platen 11, the cutting action of the edge 47 of each blade 40 is essentially a diagonal slicing action which tends to shave or slice the board surface.

When the blades 40 of the selected drum 34 become dull, the planing machine is stopped, and lock 23 and worm screw 22 are manipulated to position another of drums 34 in alignment with the travel of the boards along platen 11. Upon the subsequent dulling of the blades 40 of this latter drum 34, the next drum is positioned for cutting action. Therefore, only when the blades of all drums 34 are dulled does the cutter head 15 have to be removed for the sharpening of the blades.

As described above, when wide boards are to be planed, the cutter head 15' is employed in place of the cutter head 15. The action of the cutter head 15' is substantially identical with the action of a single drum 34 of the cutter head 15 except that a substantially wider board may be planed employing cutter head 15'.

It will be obvious to those skilled in the art that many variations may be made in the embodiment chosen for the purpose of illustrating the present invention without departing from the scope of my invention as defined by the appended claims.

I claim:

1. In a planing machine of the class wherein boards are fed along a platen and then discharged from said platen and wherein a shaft is arranged adjacent the path of travel of the boards along the platen, the combination therewith of a cutter head mounted for rotation on said shaft, said cutter head comprising a blade carrying drum concentrically mounted for rotation on said shaft, said blade carrying drum being provided with a plurality of cavities equally spaced around the periphery thereof, said cavities being arranged at an acute angle with respect to the axis of rotation of the drum, a flat blade carried in each of said cavities and means within said cavities for clamping said blade in place, the edge of said blade projecting beyond the periphery of said blade carrying drum, said blade being arranged at an acute angle of from 5° to 35° with respect to said axis of rotation, the edge of said blade being convex such that points of the locus of said blade edge are about equidistant from said axis of rotation of said blade and equidistant from the axis of rotation with respect to the edges of all other blades on its blade carrying drum.

2. In a planing machine of the class wherein boards are fed along a platen and then discharged from said platen and wherein a shaft is arranged about normal to the path of travel of the boards along the platen, the combination therewith of a cutter head mounted for rotation on said shaft, said cutter head comprising a body drum having a bore through which said shaft passes, a plurality of spaced equal diameter coaxially aligned blade carrying drums mounted for rotation on said body drum, each of said blade carrying drums being provided with a plurality of cavities equally spaced around the periphery thereof, said cavities being arranged at an acute angle with respect to the axis of rotation of the drum, a blade carried

in each of said cavities and means within said cavities for clamping said blade in place, the edge of said blade projecting beyond the periphery of of its blade carrying drum, said blade being arranged at an acute angle with respect to said axis of rotation, the edge of said blade being convex such that points of the locus of said blade edge are about equidistant from said axis of rotation of said blade and equidistant from the axis of rotation with respect to the edges of all other blades on its blade carrying drum.

3. In a planing machine of the class wherein boards are fed along a platen and then discharged from said platen and wherein a shaft is arranged about normal to the path of travel of the boards along the platen, the combination therewith of a cutter head mounted for rotation on said shaft, said cutter head comprising a plurality of equal diameter coaxially aligned blade carrying drums mounted for rotation on said shaft, each of said blade carrying drums being provided with a plurality of cavities equally spaced around the periphery thereof, a blade carried in each of said cavities and means for clamping said blade in place, the edge of said blade projecting beyond the periphery of its blade carrying drum, said blade being arranged at an acute angle with respect to said axis of rotation of said shaft, the edge of said blade being convex such that the points of the locus of said blade edge are about equidistant from said axis of rotation of said blade and equidistant from the axis of rotation with respect to the edges of all other blades on its blade carrying drum.

4. In a planing machine of the class wherein boards are fed along a platen by infeed means and then discharged from said platen and wherein a shaft is arranged across and adjacent the path of travel of the boards along the platen, the combination therewith of a cutter head mounted for rotation on said shaft, said cutter head comprising a blade carrying drum mounted for rotation on said shaft, a plurality of spaced blades carried by said blade carrying drum, the edges of said blades projecting beyond the periphery of said blade carrying drum, said blades each being arranged at the same acute angle with respect to the axis of rotation of said shaft, said edge of said blade being convex such that the points of locus along each edge are about equidistant from said axis of rotation of said shaft and equidistant from the axis of rotation with respect to the edges of all other blades on its blade carrying drum.

5. In a planing machine of the class wherein boards are fed along a platen and then discharged from said platen and wherein a shaft is arranged across and adjacent the path of travel of the boards along the platen, the combination therewith of a cutter head mounted for rotation on said shaft, said cutter head comprising a body drum having a bore through which said shaft passes, a plurality of equal diameter coaxially aligned blade carrying drums mounted for rotation on said body drum, each of said blade carrying drums being provided with a plurality of cavities equally spaced around the periphery thereof, a flat blade carried in each of said cavities and means within said cavities for clamping said blade in place, the edge of said blade projecting beyond the periphery of its blade carrying drum, said blade being arranged at an angle of from 5° to 35° with respect to said axis of rotation, the edge of said blade being convex such that the points of locus along said blade edge are about equidistant from said axis of rotation of said blade and equidistant from the axis of rotation with respect to the edges of all other blades on its blade carrying drum.

6. In a planing machine of the class wherein boards are fed along a platen and then discharged from said platen and wherein a shaft is arranged about normal to the path of travel of the boards along the platen, the combination therewith of a cutter head mounted for rotation on said shaft, said cutter head comprising a body drum having a bore through which said shaft passes, a plurality of spaced equal diameter coaxially aligned blade carrying

drums mounted for rotation on said body drum, each of said blade carrying drums being provided with a plurality of cavities equally spaced around the periphery thereof, said cavities being arranged at an acute angle with respect to the axis of rotation of the drum, a flat blade carried in each of said cavities and means within said cavities for clamping said blades in place, the edge of each blade projecting beyond the periphery of its blade carrying drum, said blade being arranged at an angle of about 15° with respect to said axis of rotation, the edge of said blade being convex such that the points of locus along said blade edge are about equidistant from said axis of rotation of said blade and equidistant from the axis of rotation with respect to the edges of all other blades on its blade carrying drum.

7. A cutter head for planing wooden boards comprising a drum, there being provided a plurality of spaced cavities along the periphery of said drum, a plurality of flat removable blades carried within said cavities, and means within each cavity for clamping said blades in place, the edges of said blades projecting beyond the periphery of said drum, each of said blades being provided with a convex cutting edge, said blades being arranged at an acute angle with respect to the axis of said drum, the convexity of said cutting edge being such that all points along said cutting edge are equidistant from said axis of said drum.

8. The structure as defined in claim 7 wherein said acute angle is from 5° to 35°.

9. The structure as defined in claim 7 wherein said acute angle is approximately 15°.

10. A cutter head for planing wooden boards comprising, a drum, and a plurality of flat blades disposed around the periphery of said drum, said blades having edges protruding beyond the periphery of said drum, said blades being arranged at from 5° to 35° from the axis of said drum, said edges being convex.

11. The structure define in claim 10 wherein the end of one of said blades overlaps the end of another blade.

12. The structure defined in claim 10 wherein said blades are received in cavities in the periphery of said drum and including gibs and gib bolts threadedly carried by said gibs, said gibs and gib bolts being within said cavities and clamping said blades against walls defining said cavities.

13. The structure defined in claim 12 wherein said blades are inclined from the radius of said drum.

14. A cutter head comprising a body drum, a plurality of coaxially aligned blade carrying drums on said body drum, each of said blade carrying drums having a plurality of blade carrying recesses, blades within said blade carrying recesses, said blades having convex edges and being arranged at an acute angle with respect to the axis of said drums, there being provided pockets in the periphery of one of said blade carrying drums, the ends of the blades of another of said blade carrying drums protruding into said pockets such that the end of the blades of one of said drums overlaps said end of the blades of said other of said blade carrying drums.

15. The structure defined in claim 14 wherein said blades are arranged at an angle of from 5° to 35° with respect to the axis of said body drum.

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