Oct. 30, 1962 J. R. CLARK 3,061,207

ROTARY WOOD CHIPPERS

Filed June 9, 1960 3 Sheets-Sheet 1

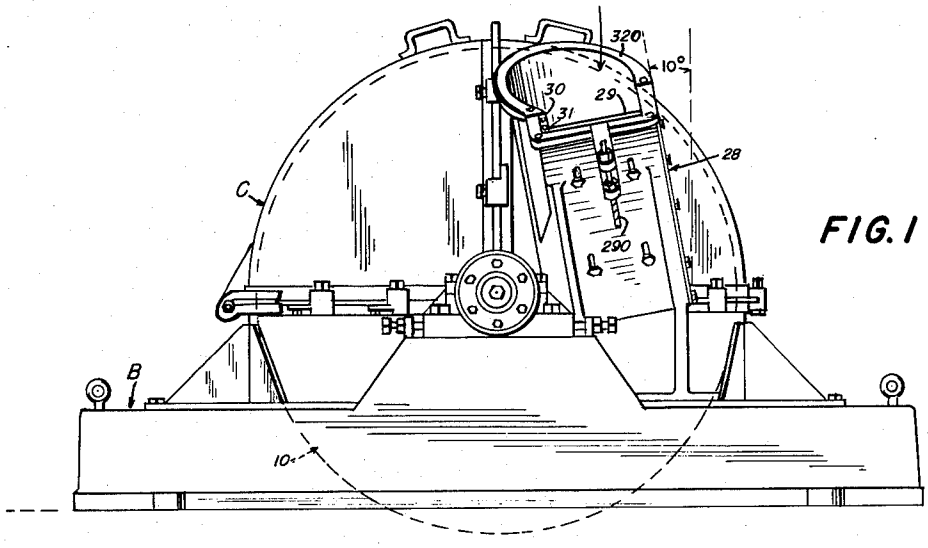


FIG. 1

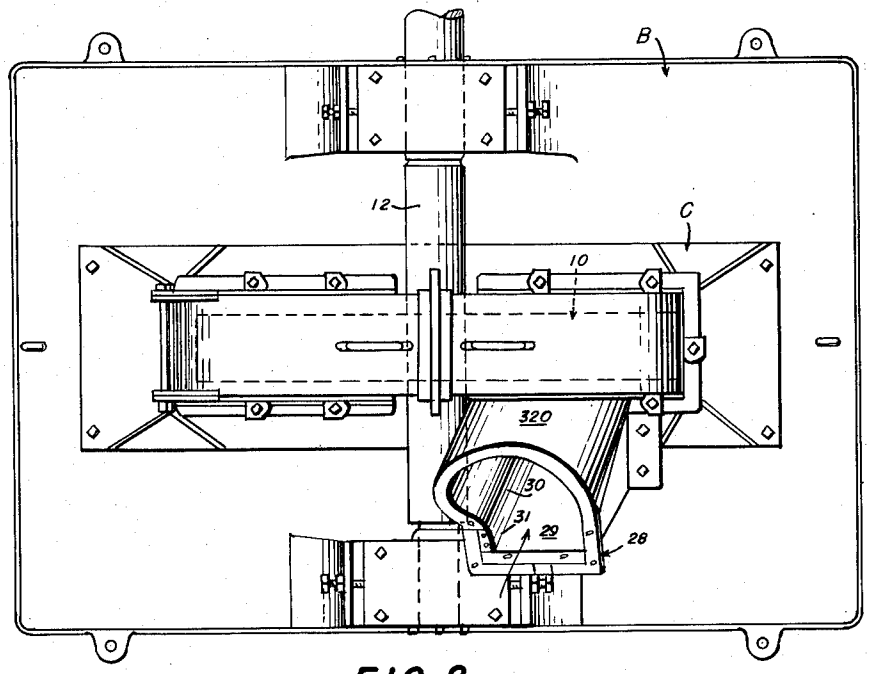


FIG. 2

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ROTARY WOOD CHIPPERS

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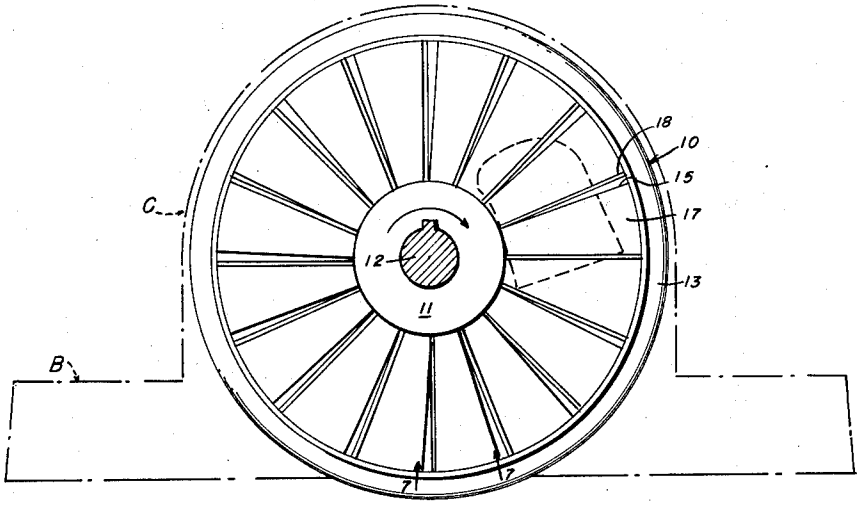


FIG. 3

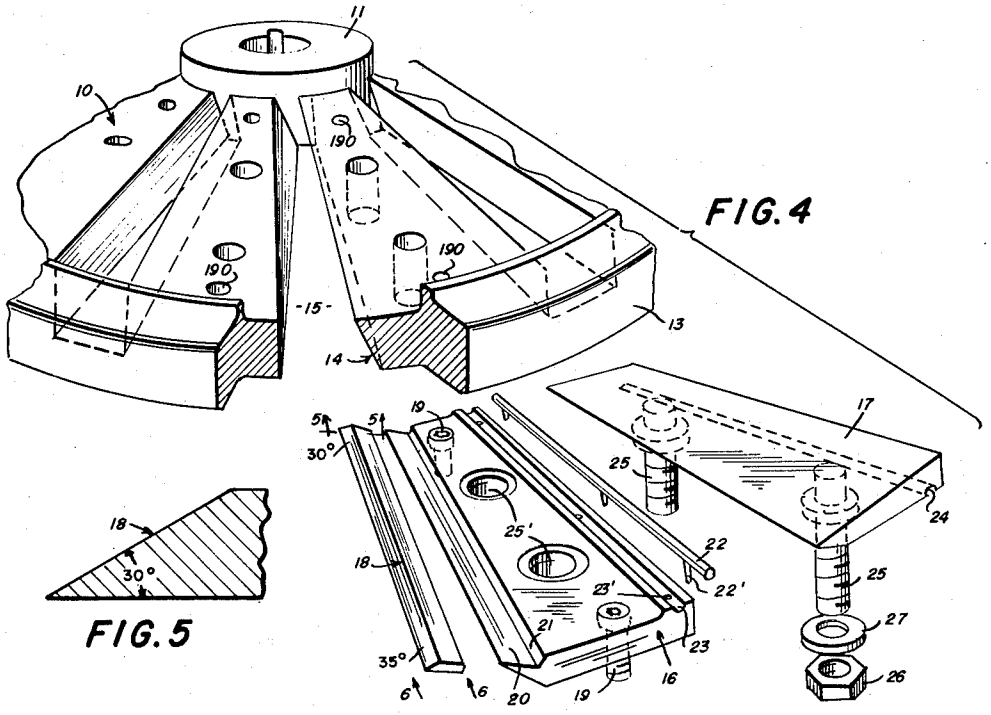


FIG. 4

FIG. 5

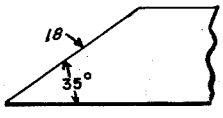


FIG. 6

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ROTARY WOOD CHIPPERS

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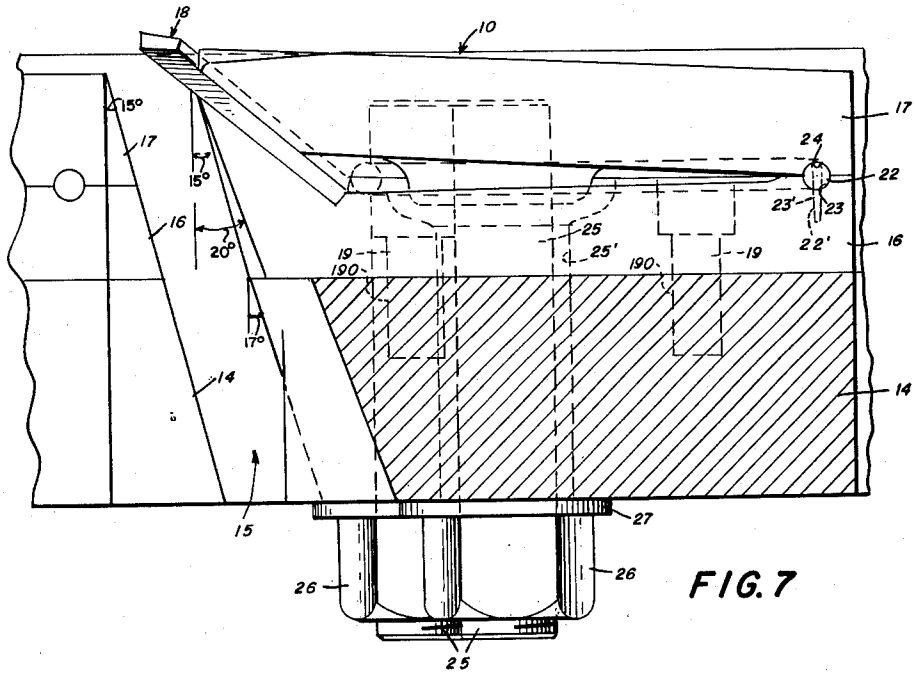


FIG. 7

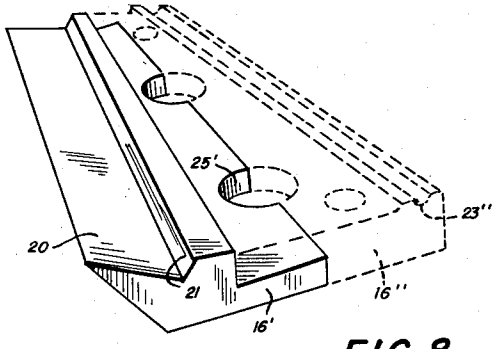


FIG. 8

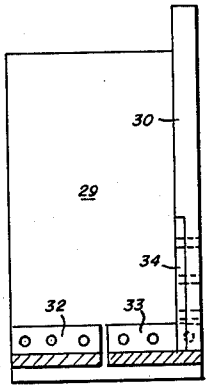


FIG. 9

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United States Patent Office 3,061,207 Patented Oct. 30, 1962

3,061,207

ROTARY WOOD CHIPPERS

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Filed June 9, 1960, Ser. No. 34,970
10 Claims. (Cl. 241—92)

This invention relates to a chipper, and more particularly to improvements in machines for cutting wood into small pieces suitable for further treatment in the production of paper pulp or the like.

More specifically the invention relates to improvements in the construction of rotary wood chippers of the type having revolving knives that cooperate with a bed knife at the lower end of an inclined or horizontal spout into which logs to be chipped are fed so that each passing knife removes chips of a predetermined length from the end of the log.

Chippers of this variety are known and many such chippers are found in the prior art showing many different forms of the several principal elements. In the known machines, the log, unless restrained, will rotate so that the successive knives passing the end of the log will tend to sharpen the end of the log much as a pencil is sharpened in a pencil sharpener. Means to restrain such log rotation add additional equipment to the chipper and requires additional expense, both from the standpoint of original manufacture and maintenance costs.

It is, therefore, a primary object of the present invention to provide a knife-carrying chipper disc so constructed and arranged that restraining devices are not required and the log passing into the chute will have chips cut from the lower or inner end thereof of uniform length the whole way across the end of the log.

It is a further object of the present invention to provide a chipper in which the angles of the blade edge and the angles at which the log chute extends with relation to the chipper disc are such as to assure efficient performance of the chipper while eliminating any tendency of the log to rotate.

Further and more specific object and advantages of the present device will be apparent from the following specification, taken in connection with the accompanying drawings in which like characters of reference refer to similar parts in the several views and in which:

FIGURE 1 is an end elevational view of the chipper of the present invention,

FIGURE 2 is a plan view of the structure shown in FIGURE 1,

FIGURE 3 is a view partly in elevation and partly in section and illustrating the rotary chipper disc,

FIGURE 4 is a fragmentary exploded perspective view partly in section showing the various elements of the chipper disc including the knife, knife rest, and knife holder,

FIGURE 5 is a cross-sectional view taken along line 5—5 on the knife element seen in FIGURE 4,

FIGURE 6 is an end elevational view of the knife shown in FIGURE 4, as viewed along viewing line 6—6,

FIGURE 7 is a view looking radially towards the hub of the chipper disc at a section taken at 7—7 in FIGURE 3 showing how the knife rest or support and knife holder are assembled on the chipper disc to hold the knife securely in place,

FIGURE 8 is a perspective, partly phantom view showing a modified form of knife rest, and

FIGURE 9 is a front elevation of the bottom and side only of the feed spout, as seen from the disc.

The chipper C includes a base B which accommodates a bearing structure supporting a horizontal shaft 12. The chipper disc 10 includes a hub 11 which is keyed to

shaft 12. One face of the disc, the active face, is provided with an annular rim 13 spaced from hub 11 by what can be termed spoke portions 14. These portions being separated from each other by the chip slots 15. A casing surrounds the disc and a feed chute or spout 28 projects outwardly from the casing as described hereinafter. On the active face of the disc, that is, that face that during rotation passes across the outlet end of the feed spout, are mounted knife means. As shown in FIGURES 3 and 4, the surfaces of the spoke portions 14 are spaced below the top of hub 11 and rim 13, a distance such as to accommodate knife rests 16 as well as knife holders 17. Knives 18 are securely clamped between the upper surface of a portion of each knife holder 17 and the undersurface of a portion of each knife rest 16. Each knife rest 16 is fastened to a spoke portion 14 of the disc by cap screws 19, engageable in recesses 19 in the disc. In effect, the knife rest generally remains fastened to the active face of the disc. The knife rests 16 are machined on both sides, so as to provide an inclined knife-accommodating surface 20, terminating in an abutment surface 21, at the lower end of this surface 20, so that between these two surfaces is defined a permanent stop for each knife blade 18, which may be adjusted by the interposition of shims or the equivalent, between the abutment surface 21 and the butt of knife blade 18.

The undersurface of each knife holder 17 is machined along one edge to the same angle as the surface 20, while at the same time, allowing sufficient space for the insertion of the blade 18. The remainder of the undersurface of the knife holders 17 is machined to clear the upper surface of the knife rests 16, and a radial spline 22 having projections 22′ is provided to fit in a groove 23 and holes 23′ along the rear edge of the upper surface of each knife rest 16 and in a groove 24 along the rear edge of the under surface of each knife holder 17, so that the knife holder 17 may swing or pivot about the spline and pulled down to clamp each blade 18 against the surface 20 of each knife rest. Each knife holder 17 is positioned by two studs 25, which extend loosely through holes 25′ in the knife rests 16, and aligned bores in the spoke portions 14 and which studs are secured in place by hexagonal nuts 26 bearing against interposed bronze washers 27. This mounting arrangement simplifies blade changing as the knife width is preset by shims or the like after grinding and before it is positioned in the disc. Each knife holder 17 has a chromium plated exposed surface serving as a wear plate, that is presented to the end of the log, and the exposed surface of each knife holder 17 has the same pitch at the end nearest the hub, as it has at the end remote from the hub. This means that the slope of the exposed face of each knife holder 17 with respect to the surface of the disc is greater adjacent the hub than adjacent the rim. The edge of each blade 18 is similarly formed and is provided with a bevel of an angle of 30° adjacent the hub, which changes to a bevel of an angle of 35° adjacent the rim. Each knife is formed of tool steel having parallel edges when ground to shape. As seen in FIGURE 7, the end of the knife 18 adjacent the hub is raised above the surface of the disc a greater amount than the end of the knife that is adjacent the rim of the disc. Since each knife 18 has a straight flat undersurface, the knife-accommodating surface 20 slopes lengthwise, as well as rearwardly. In other words, the surface 20 slopes downwards from the hub toward the rim, as well as rearwardly. The slope of the surface with respect to the plane of the chipper disc is of the order of 7/32 of an inch in 16 inches. Due to this relationship, the knife holder 16 must be made to have its surface at a permanent angle of like amount with respect to the chipper disc.

Each chip slot **15** is a combination of angles and slopes and is defined between the rear surface of one knife rest and knife holder and one wall of the slot through the disc proper, and the front edge of the adjacent blade, knife rest and wall of the slot through the disc proper. Starting at the log engaging face or knife side of the disc the effective opening of the slot in the plane of the disc face is one-half inch wide between the rear edge of a knife holder **17** and the adjacent edge of a knife **18** positioned in a knife rest **16**, and securely held in place by knife holder **17** via studs **25** and nuts **26**. The first three inches in depth of the wall of the slot beneath the knife edge at the hub end, FIG. 10, is defined by the leading edge of a knife rest swept back at about a 15° angle. The remainder of this wall of the slot is defined by the disc proper but at about a 17° sweep back. The opposite face of the slot is at a 15° angle at the hub, and normal to the plane of the disc at the rim. The rear face of the slot slopes at about 20° at the rim end forming an angular opening of three and one-half inches.

The chip size is dependent on the clearance between the edge of knife **18** and the trailing edge of knife holder **17**. As each knife passes across the end of the log it shortens the log by the amount of the length of the chips being cut. Small adjustments of the chip length (or size) may be made by shimming the knife **18** to extend farther out of the disc, but any appreciable adjustment must be made by moving the knife, in FIG. 7, down to diminish or up to increase the chip size. Also, when the length of chip is varied, the lead, or pitch, of the back of the knife holders must also be adjusted. This adjustment can only be accomplished by replacement of the knife rest **16** and knife holder in FIG. 7, with a similarly shaped but slightly differently dimensioned surfaces.

If, as shown in FIG. 8, the knife rests **16** are made in two parts **16'** and **16''** then only the forward part **16'** which is a hardened steel insert need be replaced which will effect a considerable saving, and a knife holder **17** corresponding to the knife rest **16''** must be used.

Each knife holder **17** for what ever chip size is being cut is provided with a groove **24** to receive spline **22** that also engages groove **23''** in knife rest part **16''**.

It will be noted that the front portion of the knife rest part **16''** that is secured to the disc **14** includes a tongue that overlaps a complementary tongue at the rear portion of part **16'** that carries the knife. The amount of this overlap may be such that, upon release of bolts **19**, the forward part **16'** can be moved circumferentially forward to clear the overlap, and then moved radially. A slight dovetailing of the overlapping portions of **16'** and **16''** will reduce the possibility of part **16'** moving under the influence of the heavy clamping pressure of the knife exerted by holder **17** and the blade against surface **20**.

A feed spout means **28** is connected to the casing and includes an axially adjustable bed-knife carrying liner or insert including a flat bottom portion **29** and a wide wall portion **30** at right angles to the bottom portion **29**. Axially adjustable means **290** are provided to change the position of the bed knives relative to the plane of rotation of the chipping edges of knives **18**. In order to define the angularity of this spout with respect to the cutting disc described above, the line of intersection between the liner bottom **29** and side **30** may be taken as a datum. This line or datum **31**, FIG. 2, intersects the plane surface of the disc somewhat below the horizontal center of the disc and spaced to one side of the disc center by about the radius of the hub portion **11**. The projection of this line in a vertical plane through the disc axis lies at an angle of 38° to the vertical and the projection of this line in a horizontal plane through the center of the disc describes an angle of 12° 30 minutes with respect to the center line of the disc. The spout bottom **29**, and wall **30** are covered by a cover element **320**, the chief characteristic of which is that it does not interfere with the introduction of the maximum size of log into the log feed chute.

In operation, a log is fed downward into feed spout **28**, at the bottom of which, along liner bottom **29**, and side wall **30** are exchangeably mounted stationary blades or bed knives formed as inserts **32**, **33**, and **34** that lie parallel to the slightly conical path swept by the sharpened edge of knives **18**. The number of knives **18** is sufficient so that there are at all times at least three such blades extending across and sweeping over the open bottom end of spout **28** at all times, as indicated by the broken line in FIGURE 3.

Each knife as it descends would strike a log of maximum diameter in the machine and cuts through until it is substantially parallel to the bottom **29** of the feed spout **28**, then the second blade engages the log thereby preventing twist or spinning of the log. This positive support reduces the likelihood of rotation of the log in the feed spout **28**.

As each knife descends, it sweeps to angular positions with respect to the feed spout bottom such that if smaller logs are inserted, the knife, as it first strikes the log, forms the hypotenuse of a triangle with the other two sides being the bottom **29** and the side **30** of the feed spout **28**. Because of this, the log of whatever size it may be, is positively supported in the machine. It will be seen also that slabs may be cut into chips without the difficulty of the slabs turning in the feed spout.

As seen in FIGURE 9, the lower edges of the bottom **29** and the side **30** of the spout are provided with removable and replaceable inserts constituting the bed knives **32**, **33** and **34**. The bed knives **32** and **33** may be identical short knives or may be combined into one bed knife; bed knife **34** must be a parallelogram rather than a rectangle to accommodate the angle at which the side **30** intersects the plane of the knife edge.

Each knife also, by its shape and positioning, tends to correct the predisposition of the log to rotate in the spout.

The variation in the acuteness of the angle of the cutting edge of the knife also has its effect on eliminating the tendency of the log to rotate in the spout since the force required to push the knife through the log varies as the acuteness of the angle of the cutting edge varies and as the velocity of the knife varies. The velocity of the knife varies from hub end to rim end in direct proportion to the distance from the axis of rotation. The acuteness of the knife edge is varied from about 30° near the hub to 35° at the rim to balance the effect of the velocity.

The removability of the bed knives **32**, **33** and **34**, permit the same spout with different bed knives to be used either as an inclined feed spout as shown or as a horizontally disposed feed spout. The use of an exchangeable hardened steel insert part **16'**, FIG. 8, provides an inexpensive mode of changing chip size, since one can produce several size insert parts dimensioned for varying chip sizes.

In operation, therefore, the present invention provides a device that will sever uniform chips from the logs because of the construction and arrangement of the parts that eliminate the tendency of the logs to rotate in the feed spout.

The above description of a machine incorporating the invention is not to be taken as limiting but rather as exemplary, and in order to define the scope of protection I desire to secure by Letters Patent.

What is claimed is:

1. In a rotary wood chipper, a rotary chipper disc including a hub portion, a rim portion and an intermediate portion extending between the hub and rim portions and having less thickness than said hub and rim portions so as to define an annular recess in one face of said disc, said intermediate portion having a plurality of radially extending slots therethrough, a plurality of knife rests corresponding in number to the number of slots, each knife

rest having a length such as to extend between the hub and rim portions and being positioned on said disc along the trailing edge of each slot as regards the direction of rotation of the disc, each knife rest including an angular knife-accommodating surface sloping away from its leading edge, an abutment surface extending at right angles to said knife-accommodating surface and delimiting the rearward extent thereof, said abutment surface having an extent transverse to its length corresponding to the thickness of a knife to be supported thereby, each knife rest further including an exposed surface extending rearwardly from the abutment surface, and a rear end surface, a plurality of chipping knives corresponding in number to the number of knife rests, each knife being positioned on a knife-accommodating surface and backed up by an abutment surface and having an exposed chipping edge and a knife holder means for cooperation with each knife rest and knife and including a surface shaped to define an inclined knife-engaging clamping face, and a knife rest engaging surface at least adjacent the rearward edge of the knife holder means, the facing surfaces of said knife rests and knife holder means having complementary, radially extending grooves therein adjacent their respective rear end surfaces and a radial spline in said grooves permitting a pivoting movement of each knife holder means with respect to each knife rest, each knife holder means further including an exposed surface and a rear end surface, and means for removably securing each knife holder means against the respective knives and knife rests and to the disc with the rear end surfaces of each knife holder means merging with the rear end surface of each knife rest and positioned to constitute the leading edge of the next adjacent slot.

2. In a rotary wood chipper, a rotary chipper disc including a hub portion, a rim portion and an intermediate portion extending between the hub and rim portions and having less thickness than said hub and rim portions so as to define an annular recess in one face of said disc, said intermediate portion having a plurality of radially extending slots therethrough, a plurality of knife rests corresponding in number to the number of slots, each knife rest having a length such as to extend between the hub and rim portions and being positioned on said disc along the trailing edge of each slot as regards the direction of rotation of the disc, each knife rest including an angular knife-accommodating surface sloping away from its leading edge, an abutment surface extending at right angle to said knife-accommodating surface and delimiting the rearward extent thereof, said abutment surface having an extent transverse to its length corresponding to the thickness of a knife to be supported thereby, each knife rest further including an exposed surface extending rearwardly from the abutment surface, and a rear end surface, a plurality of chipping knives corresponding in number to the number of knife rests, each knife being positioned on a knife accommodating surface and backed up by an abutment surface and having an exposed chipping edge and a knife holder means for cooperation with each knife rest and knife and including a surface shaped to define an inclined knife-engaging clamping face, and a knife rest engaging surface at least adjacent the rearward edge of the knife holder means, each knife rest comprising two parts, one part including said knife-accommodating surface and said abutment surface, said one part further having a rearwardly extending tongue, and the other part of each knife rest including a tongue adapted to overlap said first-mentioned tongue, each knife holder means further including an exposed surface and a rear end surface, and means for removably securing each knife holder means against the respective knives and knife rests and to the disc with the rear end surface of each knife holder means merging with the rear end surface of each knife rest and positioned to constitute the leading edge of the next adjacent slot.

3. A rotary chipper as claimed in claim 2 and said other part of each knife rest having a radially extending groove in the face thereof directed towards the associated knife holder means, each knife holder means having a complementary groove therein on the face thereof adjacent said other part of each knife rest and a radial spline in said grooves permitting a pivoting movement of each knife holder means relative to each two part knife rest.

4. In a rotary chipper, a rotatable chipper disc having a plurality of radially extending slots therethrough, a feed spout means through which wood to be chipped can be fed toward said disc, knife rest means securely fixed to the disc between each pair of radial slots, each knife rest means having an inclined knife-accommodating surface extending away from leading radial edge of the knife rest means further including an abutment surface extending at right angles to the knife-accommodating surface and delimiting the inner end thereof, a knife holder cooperable with each knife rest means, each knife holder having a knife engaging clamping surface on the side thereof directed toward and overlying said knife-accommodating surface and being parallel therewith, each knife rest means and knife holder further including a rear end surface, said rear end surface merging with one another and with the leading edge of the underlying slot, the facing surfaces of each knife rest means and knife holder rearwards of each abutment surface, making limited contact, and a radially extending spline between said facing surfaces adjacent said rear surfaces, and knives each having a chipping edge, said knives being positioned between each knife-accommodating surface and knife-clamping surface, and stud means extending from each knife holder through the associated knife rest means and through said chipper disc whereby each knife is securely clamped between said knife-accommodating and knife-clamping surfaces.

5. In a chipping machine for forming chips from lengths of wood, a rotatable chipper disc having a plurality of radial slots therethrough, said disc including a hub and a rim, feed spout means for feeding lengths of wood in a direction toward the plane of said disc, knife rests extending radially between said hub and rim and between each pair of slots, a knife holder overlying each knife rest and also extending from one slot to the next adjacent slot, said knife rests and knife holders having opposed, complementary, parallel surfaces adjacent the radial edges thereof that constitute their leading edges in the direction of rotation of said disc so as to receive a knife therebetween, means providing a pivot connection between each knife rest and knife holder adjacent their trailing radial edges, the axis of each such pivot connection extending radially of the disc, said opposed, parallel surfaces lying at an angle to the plane of the disc that extends from the leading radial edges toward the plane of the disc, chipping knife elements each having parallel faces for contact with and engagement between said complementary parallel surfaces, each knife element having an exposed bevelled edge extending in the direction of rotation of said disc and means to draw said knife holders toward said disc and means to draw said knife holders toward said disc to clamp said elements against said knife rests.

6. A chipper as claimed in claim 5 in which the bevel edge of each knife element varies from 30° adjacent the hub of the disc to 35° adjacent the rim of the disc.

7. A chipper as claimed in claim 5 in which each knife rest includes two radially extending portions, one portion constituting a hardened steel insert and having one of said complementary parallel surfaces thereon and a rearward extension of reduced thickness, the other portion of each knife rest including a forward extension of reduced thickness adapted to overlie the rearward extension of said first-mentioned portion.

8. A chipper as claimed in claim 5 in which the radial knife edges lie in the surfaces of flat cones and the surfaces of the knife holder extending between the respective knife edges and the next adjacent slot are helicodial surfaces, the plane of which includes said radial knife edges.

9. A chipper as claimed in claim 5 in which said feed spout includes a plurality of flat surfaces angularly disposed with respect to each other, bed knives associated with said spout adjacent said disc, and said bed knives comprising replaceable inserts mounted at the end of the spout adjacent said disc.

10. A chipper as claimed in claim 9 and said spout including a liner member having a flat bottom and at least one side, said bed knives including knives mounted on the side and bottom of said liner member, and means for axially adjusting the position of said liner member with respect to the plane of the disc so as to adjust the position of said bed knives with respect to said chipper knife elements.

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