United States Patent [19]

Mallery

[11] **3,880,215**

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[54] **WOOD CHIPPING APPARATUS**

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[52] **U.S. Cl.** ..... **144/39**; 144/3 R; 144/118; 144/162 R; 144/220; 144/322; 144/326

[51] **Int. Cl.** **B27c 9/10**

[58] **Field of Search** ..... 144/3 R, 3 P, 39, 118, 144/116 R, 162 R, 318, 220, 176, 312, 321, 322, 326 R, 326 A, 326 B, 326 L, 326 D, 114 R

[56] **References Cited**

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3,627,065	12/1971	Morton	144/176 X
3,777,793	12/1973	Miller	144/220
3,780,778	12/1973	Chapman	144/162 R X

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[57] **ABSTRACT**

A wood chipping apparatus for removing the rough outer surface of a log and forming a smooth, planar surface thereon includes a chipping head mounted for rotation with a shaft supported by bearings on a base member perpendicular to the direction of travel of a log past the chipping head. The shaft is rotated at a preselected speed by an electric motor. A circular saw is secured to the outer planar face of the chipping head and includes a plurality of teeth which project radially outwardly on the periphery of the saw. A plurality of cutting elements are secured to the surface of the chipping head and project radially outwardly therefrom. Each of the cutting elements includes an edge portion positioned at a 45° angle to the axis of rotation of the shaft. The edge portions are positioned within the space provided between adjacent teeth on the saw. In one embodiment the teeth extend beyond the inner shoulder portion of each of the cutting edges to cut parallel to the grain of the log in advance of the cutting edges which cut against the grain of the log. In this fashion, the rough outer surface of the log is removed in chip form leaving a smooth, planar surface on the outer portion of the log.

5 Claims, 4 Drawing Figures

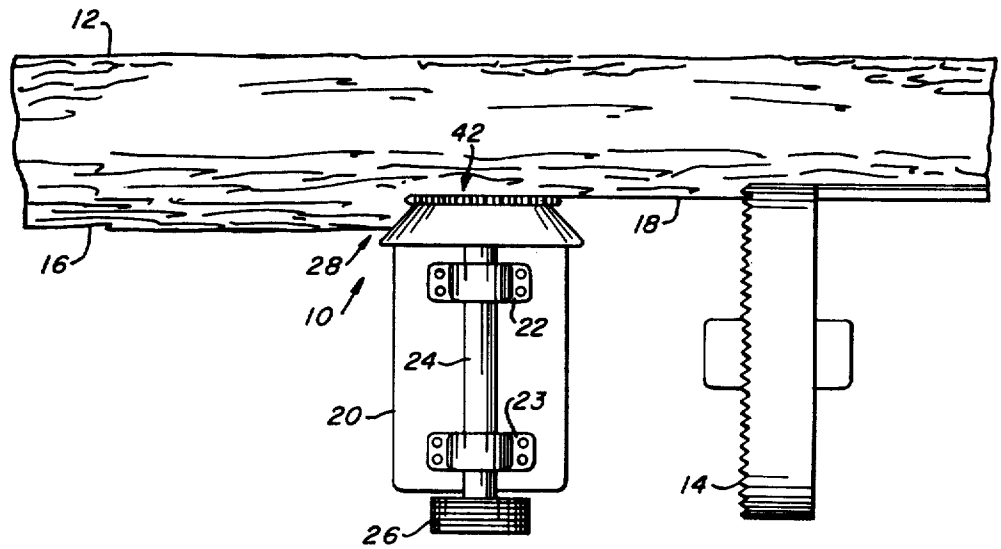


FIG. 1

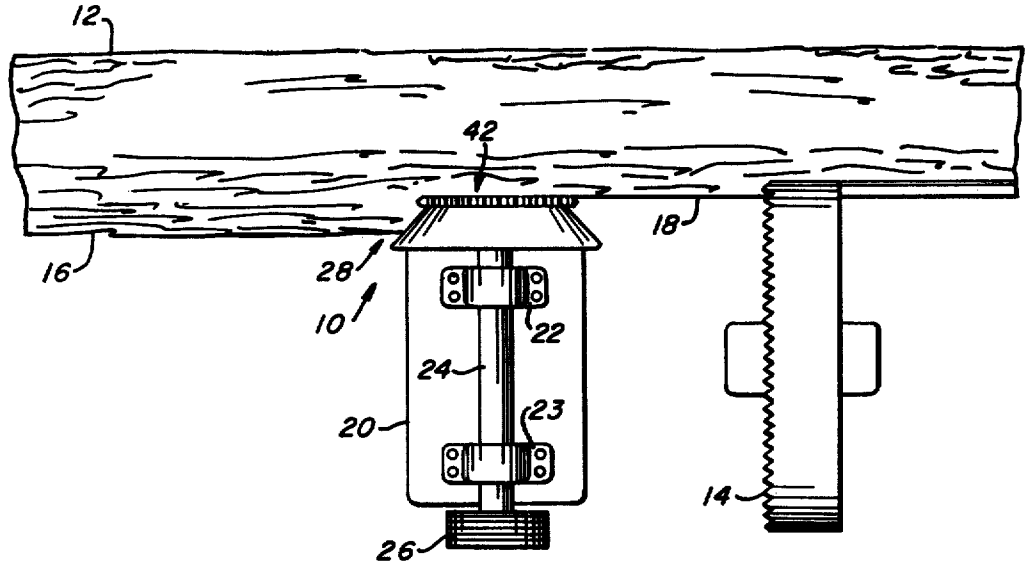


FIG. 2

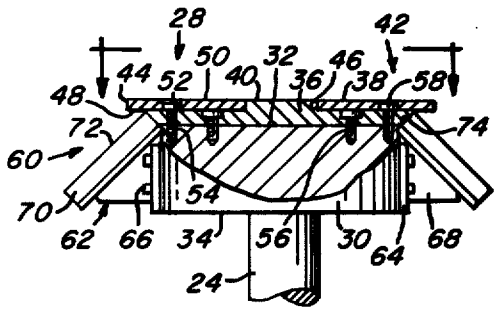


FIG. 3

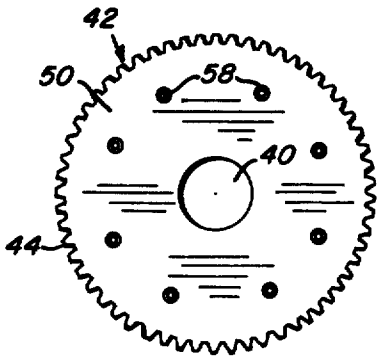
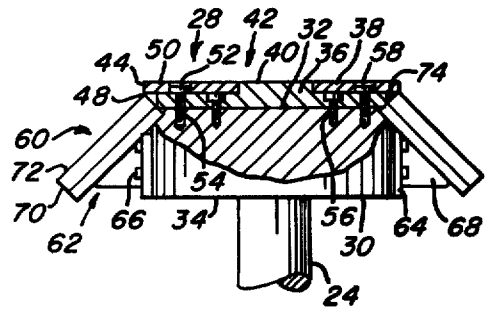


FIG. 4



WOOD CHIPPING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an apparatus for removing in chip form the rough outer surface of a log and more particularly to an apparatus which provides for a smooth outer surface of the log following the removal of the rough outer surface.

2. Description of the Prior Art

U.S. Pat. Nos. 3,570,567; 3,190,326; 3,282,312 and 2,922,488 illustrate and describe devices for removing bark or the rough outer surface of a log or piece of lumber in which a multiplicity of cutters are mounted on a rotatable head assembly. Generally, each of the knives is L-shaped, having a severing edge and a finishing edge angularly disposed to one another. Preferably, the blades are arranged to form an obtuse angle. The knife is secured by clamps to the conical surface of the head assembly and is so positioned such that when the log moves past the head assembly by operation of feed rolls or a carriage, the first cut is made by the severing edge across the grain of the log. Then the finishing edge follows, moving through the log or woodpiece substantially parallel to the grain in a planing cut to dislodge the bark or rough outer surface in chip form, leaving a planar surface that becomes the outer surface of the first board to be cut.

Each knife must be precisely mounted on the conical surface of the head to assure that the corresponding severing edges and finishing edges make cuts of equal depth into the surface of the woodpiece. Such precision is difficult to maintain with knives having both severing and finishing edges in that the knife edges are continuously subjected to bending and shearing stresses which are proportional to the rate of rotation of the head assembly and the feed of the log past the head assembly. As a result, misalignment of the knives on the head assembly attributed to the application of these forces produces gouging cuts in the woodpiece. Subsequently, a second finishing cut must be made to remove the gouged outer surface and provide a smooth outer surface for the first board to be cut from the woodpiece.

The chips are dislodged from the woodpiece following the cutting action of the severing and finishing edges by the bent portion of the knife, which is formed at the intersection of the body portion of the knife edges, striking the chip. This action has the effect of disrupting the surface continuity of the woodpiece producing ripples on one surface of the first board. In the cutting or hardwoods, this same cutting action produces a lifting or tearing out of wood from the face of the first board to be cut from the log.

The continued impact between the bent portion of the knife and the chip to be dislodged subjects the knife to further wear, resulting in misalignment of the knives on the head assembly and requiring their eventual replacement. There is need to provide a cutting apparatus which removes the rough outer surface of a woodpiece in chip form and cuts the woodpiece to produce a smooth planar outer surface for the first board to be cut from the woodpiece, thereby avoiding unnecessary waste of material and subsequent finishing cuts to be performed before the first board is cut.

SUMMARY OF THE INVENTION

This invention relates to an apparatus for removing the rough outer surface of a log and for forming a planar surface thereon which includes a support member having a shaft rotatably mounted thereon. A motor is provided for rotating the shaft at a preselected speed. A head is axially mounted on the shaft for rotation therewith and includes an outer planar face. A plurality of cutting elements are secured to the surface of the head and project radially outwardly therefrom to provide a first cut across the grain of the log. A circular saw having a plurality of teeth which project radially outwardly on the periphery thereof is rigidly secured to the outer planar face and rotates therewith to provide for a second cut parallel to the grain of the log.

Each of the cutting elements include a knife blade holder which rigidly supports a knife blade an elongated cutting edge. The knife blade holder supports the knife on the conical surface of the head so that the cutting edge projects outwardly from the surface of the head at an acute angle with the axis of rotation of the shaft.

In one embodiment of the present invention, the knife blade is arranged on the surface of the head with the inner shoulder portion of the knife edge positioned adjacent the teeth of the circular saw. The teeth extend beyond the inner shoulder portion to permit the teeth to cut the log in advance of the knife edge portion adjacent the inner shoulder. With this arrangement, an initial cut is completed by the circular saw along the grain to produce a smooth continuous surface, free of surface irregularities. The first cut is followed by a second cut accomplished by the knife edge cutting across the grain to sever a chip from the log which is suitable for use in pulping operations leaving a smooth, planar surface on one side of the first board to be cut from the log.

In a second embodiment, the knife blade may be retained on the surface of the head so that the inner shoulder portion of the cutting edge extends forwardly of the teeth to permit the knife edge to cut in advance of the teeth. In this fashion a severing cut is initially made across the grain of the log then followed by a second finishing cut made by the circular saw parallel to the grain dislodging a chip from the log and providing a smooth, planar surface having no irregularities thereon.

Accordingly, the principal object of this invention is to provide a circular saw in combination with a plurality of cutting elements positioned radially on the surface of a rotating head for removing the rough outer surface of boards or logs in chip form suitable for pulping operations leaving an outer surface on the board or log having a smooth, planar surface with no undesirable irregularities.

Another object of this invention is to provide a wood chipping apparatus which removes the outer bark of a log without tearing or gouging the outer surface of the first board to be cut from the log.

These and other objects and advantages of this invention will be more completely described and disclosed in the following specification, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic illustration of the combination chipping head and circular saw for removing the rough outer surface of a log and forming a smooth, planar surface for subsequent cutting operations.

FIG. 2 is a plan view partially in section illustrating the circular saw arranged on the chipping head to cut the log parallel to the upper portion of the grain in advance of the cutting elements arranged on the chipping head to cut the log across the grain.

FIG. 3 is a view in side elevation taken along the line III—III of FIG. 2 illustrating the circular saw mounted on the hub portion of the cutting head.

FIG. 4 is a plan view partially in section of another embodiment of the present invention illustrating the cutting elements arranged on the chipping head to cut the log across the grain in advance of the circular saw arranged on the chipping head to cut the log parallel to the grain.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings and particularly FIGS. 1, 2 and 3, there is illustrated the chipping assembly generally designated by the numeral 10 positioned substantially perpendicular to the direction of feed of the log 12 on a carriage (not shown) past the chipping assembly 10. Arranged adjacent the chipping assembly 10 is a band saw 14 which cuts the log longitudinally to form boards having a preselected thickness after the chipping assembly 10 has debarked or removed the rough outer surface 16 of the log in chip form leaving a smooth, planar surface 18 which becomes one side of the first board to be cut from the log 12.

The chipping assembly 10 includes a base portion 20 which supports the bearings 22 and 23. The bearings 22 and 23, in turn, rotatably support a shaft 24 that is rotated at a preselected speed by a suitable drive means, such as the electric motor 26. The bearings 22 and 23 are bolted to the base portion 20 and maintain the axis of rotation of the shaft 24 perpendicular to the direction feed of the log 12.

A chipping head generally designated by the numeral 28 includes a cylindrical member 30 nonrotatably mounted on the end of the shaft 24 adjacent the log 12. The cylindrical member 30 has a front planar face 32 and a rear planar face 34. A circular plate member 36, as illustrated in FIG. 2, is secured to the front planar face 32 of the cylindrical member 30 by the bolts 38.

The plate member 36 includes a cylindrical hub portion 40 that projects outwardly from the center of the plate member 36 and is coaxially aligned with the shaft 24. A circular saw generally designated by the numeral 42 having a plurality of blunt edge teeth 44 projecting radially outwardly on the periphery thereof and a central aperture 46 is axially mounted on the hub 40. The blunt outer edge of the teeth has a length greater than the thickness of the circular saw 42. The rear surface 48 of the circular saw 42 is positioned in abutting co-planar relationship with the top surface of the plate member 36. The top surface 50 of the saw 42 is aligned in co-planar relationship with the surface of the end of the hub 40 to provide a continuously uniform surface on the chipping head 28.

The circular saw 42 includes a plurality of radially spaced bores 52 positioned adjacent the periphery of the saw. The bores 52 are aligned with the vertically aligned bores 54 provided in the plate member 36 and the bores 56 of the cylindrical member 30. Bolts 58 threadedly engage the vertically aligned bores 52, 54 and 56 to thereby nonrotatably secure the circular saw 42 to the cylindrical member 30. With this arrangement, rotation of the shaft 24 is transmitted through the cylindrical member 30 and the plate member 36 to the circular saw 42. Thus, the circular saw 42 rotates at the speed of the shaft 24 with the teeth 44 maintained parallel to the longitudinal axis of the log 12 being fed past the chipping assembly 10. The cutting forces applied to the saw 42 are transmitted through the plate member 36 to the cylindrical member 30 so that the saw 42 cuts the log 12 along or parallel to the grain.

As illustrated in FIG. 2, a plurality of cutting elements generally designated by the numeral 60 are rigidly secured to the surface of the cylindrical member 30 to project radially outwardly therefrom. Each of the cutting elements 60 includes a knife holder 62 having a base portion 64 secured by bolts 66 to the cylindrical member 30. Formed integrally with the base 64 and projecting outwardly therefrom is a support portion 68. A knife 70 having an elongated cutting edge portion 72 is securely mounted by suitable means to the support portion 68. The support portion 68 maintains the edge portion 72 aligned at an acute angle with the axis of rotation of the head assembly 28, preferably at a 45° angle. In this fashion, rotation of the shaft 28 is transmitted through the cylindrical member 30 to the knife 70 and thereby provides a slicing action across the grain of the log 12 as the circular saw 42 cuts along or parallel to the grain of the log to thereby sever the rough outer surface 16 from the log 12 in chip form. The chips thus formed are substantially suitable for use in pulping operations.

As illustrated in FIG. 2, the teeth 44 of the circular saw 42 project outwardly beyond or lead the inner shoulder portion 74 of each of the knives 70 so that the circular saw 42 cuts the log 12 along the grain before the edge portions 72 adjacent the shoulder portion 74 cut across the grain. In addition, the knives 70 are arranged on the cylindrical member 30 so that each cutting edge 72 is positioned adjacent the space between adjacent teeth 44 of the saw 42. This arrangement assures that each knife 70 on the chipping head 28 cuts to an equal depth across the grain of the log 12 and to the depth at which the circular saw 42 cuts along the grain of the log. In this fashion, chips of suitable size are severed from the log 12 for use in pulping operations. The smooth, planar surface 18 is formed on the surface of the log, and the first board cut from the log 12 by the band saw 14 is not wasted by virtue of gouges formed in the outer surface.

Further in accordance with the present invention, there is illustrated in FIG. 4 another embodiment in which previously indicated numerals refer to identical parts illustrated in FIG. 2. Each knife 70 is supported by the holder 62 on the cylindrical member 30 with the inner shoulder portion 74 extending forwardly of the teeth 44 and the edge portion 72 projecting into the space between adjacent teeth 44, as described above. The edge portions 72 adjacent the shoulder 74 lead the teeth 44 to provide for initial cutting of the outer surface 16 by cutting across the grain of the log 12. Following the severing action of the edge portions 72, the saw teeth 44 cut along the grain in a finishing cut to produce a smooth board edge and complete the prior cut of the edge portions 72 to dislodge chips from the log 12. This arrangement is suitable for removing the rough outer surface of hardwood logs in which it is desirable to initially cut across the grain rather than along the grain to avoid vibration of the circular saw 42.

Either arrangement with the edge portions 72 following or leading the cutting action of the circular saw 42 removes the rough outer surface of the log 12 in the form of chips which are suitable for use in pulping operations leaving a smooth, planar surface free of gouges and irregularities. Consequently, the first board which is to be cut from the log 12 is not wasted and is therefore utilized providing increased quantity of finished material from the log 12.

According to the provisions of the patent statutes, I have explained the principle, preferred construction and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiments. However, it should be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. Apparatus for removing the rough outer surface of a log and forming a planar surface thereon comprising,
a support member,
a shaft rotatably mounted on said support member,
means for rotating said shaft at a preselected speed,
a head axially mounted on said shaft for rotation therewith, said head having an outer planar face,
a plate member fastened to said forward planar face and having a hub portion projecting outwardly from the center of said plate member,
a plurality of cutting elements secured to the surface of said head and projecting radially outwardly therefrom to provide a first cut across the grain of the log,
circular saw having a plurality of teeth projecting radially outwardly on the periphery thereof, said circular saw having a center aperture arranged to receive said hub portion, and
bolt means passing through said plate member and rigidly securing said circular saw blade to said head outer planar face for rotation therewith to provide a second cut parallel to the grain of the log.

2. Apparatus as set forth in claim 1 in which each of said cutting elements includes,
a knife having a cutting edge portion projecting outwardly from the surface of said head at a 45° angle with the axis of rotation of said shaft.

3. Apparatus as set forth in claim 1 in which,
each of said teeth includes a blunt top edge, and
said blunt top edge having a length greater than the thickness of said circular saw.

4. Apparatus for removing the rough outer surface of a log and form a planar surface thereon comprising,
a support member,
a shaft rotatably mounted on said support member,
means for rotating said shaft at a preselected speed,
a head axially mounted on said shaft for rotation therewith, said head having an outer planar face,
a knife holder rigidly mounted on the surface of said head,
a plurality of knives having elongated cutting edge portions,
said knives secured to said knife holder such that said cutting edge portion projects outwardly from the surface of said head at an acute angle with the axis of rotation of said shaft to provide a first cut across the grain of the log,
a circular saw having a plurality of teeth projecting radially outwardly on the periphery thereof and rigidly mounted to said outer planar face for rotation therewith to provide a second cut parallel to the grain of the log,
said knives having an inner shoulder portion positioned adjacent said circular saw teeth with said cutting edge portion positioned adjacent the space between adjacent teeth, and
said circular saw teeth extending beyond said inner shoulder portions of said knives to permit said teeth to cut the log in advance of said cutting edge portions of said knives adjacent said inner shoulder portions.

5. Apparatus for removing the rough outer surface of a log and form a planar surface thereon comprising,
a support member,
a shaft rotatably mounted on said support member,
means for rotating said shaft at a preselected speed,
a head axially mounted on said shaft for rotation therewith, said head having an outer planar face,
a knife holder rigidly mounted on the surface of said head,
a plurality of knives having elongated cutting edge portions,
said knives secured to said knife holder such that said cutting edge portion projects outwardly from the surface of said head at an acute angle with the axis of rotation of said shaft to provide a first cut across the grain of the log,
a circular saw having a plurality of teeth projecting radially outwardly on the periphery thereof and rigidly mounted to said outer planar face for rotation therewith to provide a second cut parallel to the grain of the log,
said knives having an inner shoulder portion positioned adjacent said circular saw teeth with said cutting edge portions positioned adjacent the space between adjacent teeth, and
said inner shoulder portions of said knives extending forwardly of said teeth to permit said knives cutting edge portions to cut the log in advance of said teeth.

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