July 23, 1963 C. W. KENDRICK 3,098,512

DEBARKING MACHINE

Filed Sept. 4, 1959 4 Sheets-Sheet 1

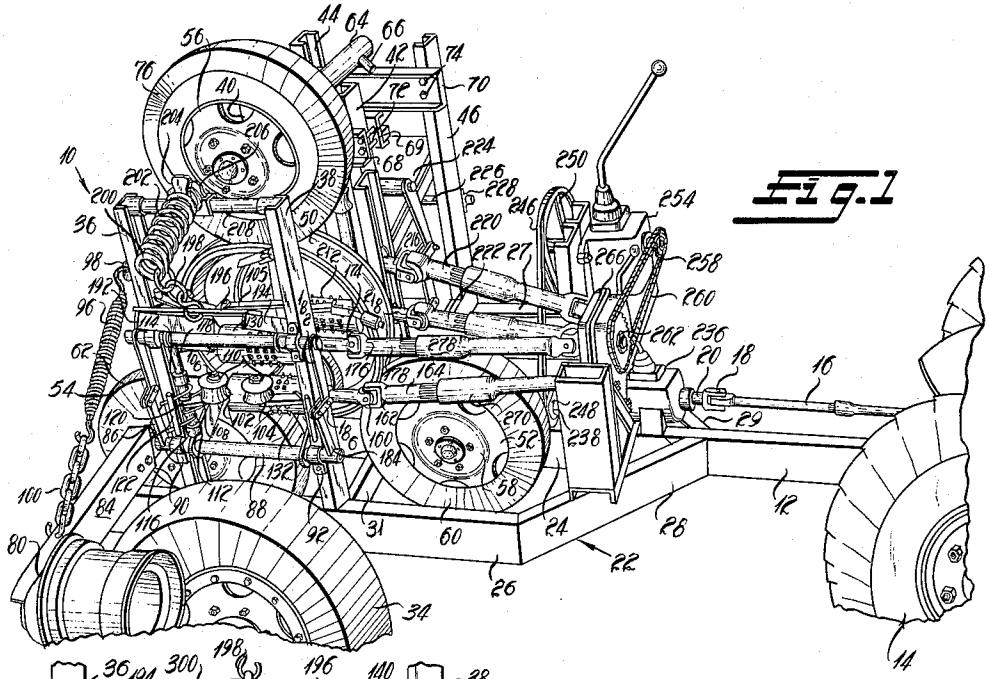


Fig. 1

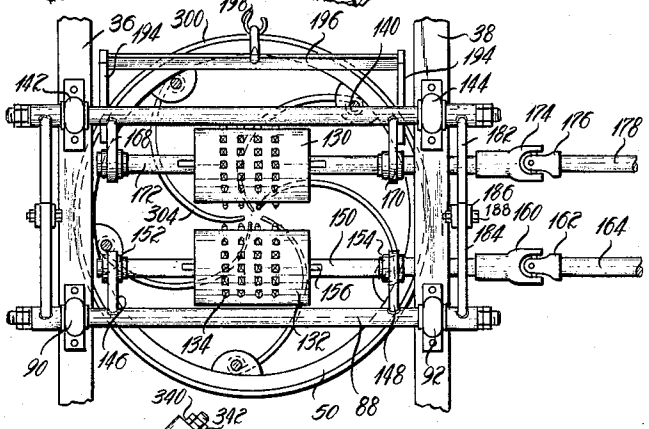


Fig. 4

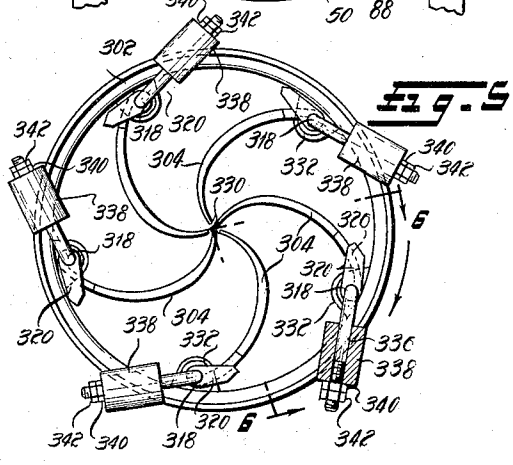


Fig. 5

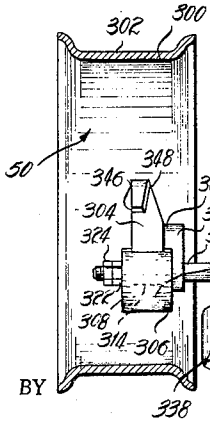


Fig. 6

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DEBARKING MACHINE

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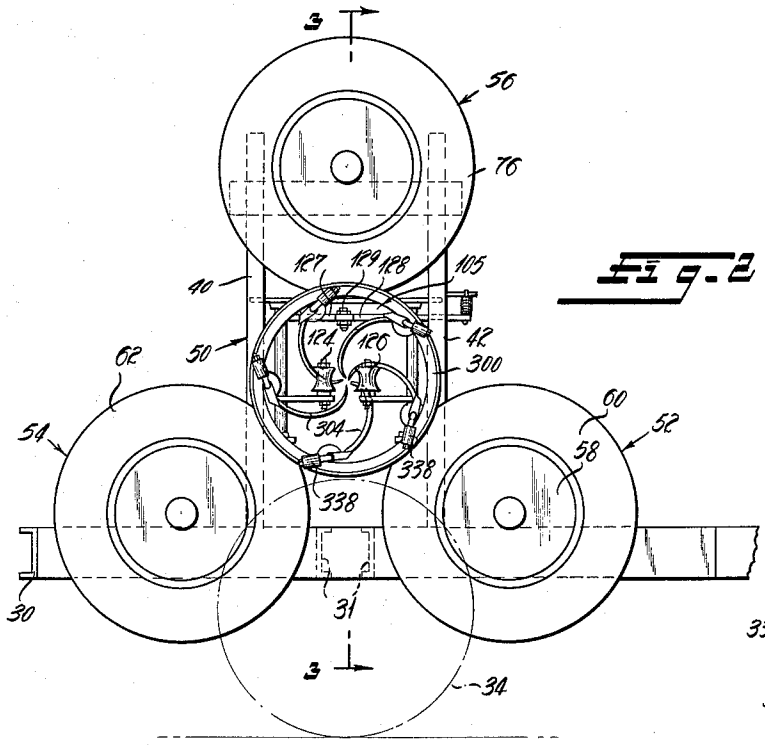


Fig. 2

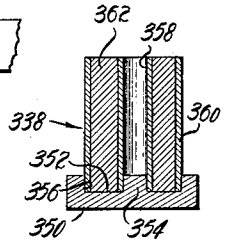


Fig. 4

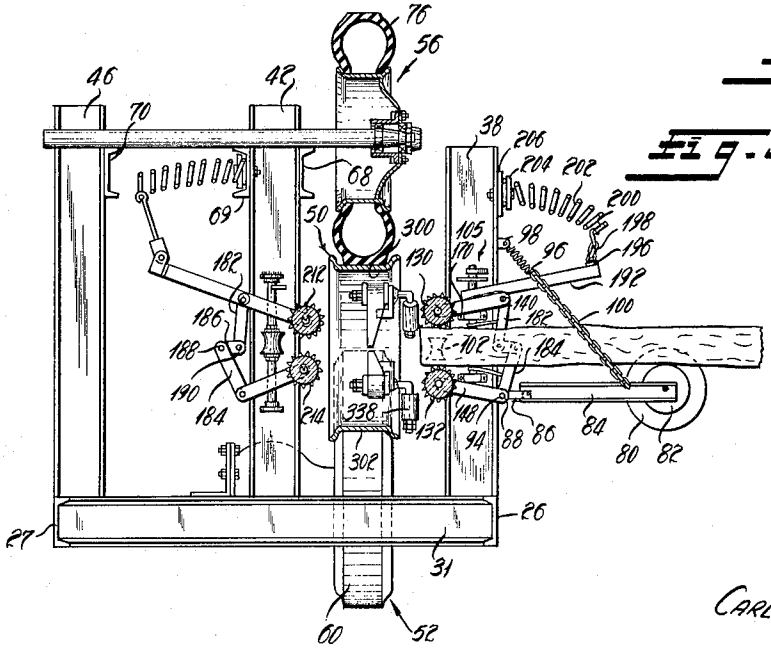


Fig. 3

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July 23, 1963 C. W. KENDRICK 3,098,512

DEBARKING MACHINE

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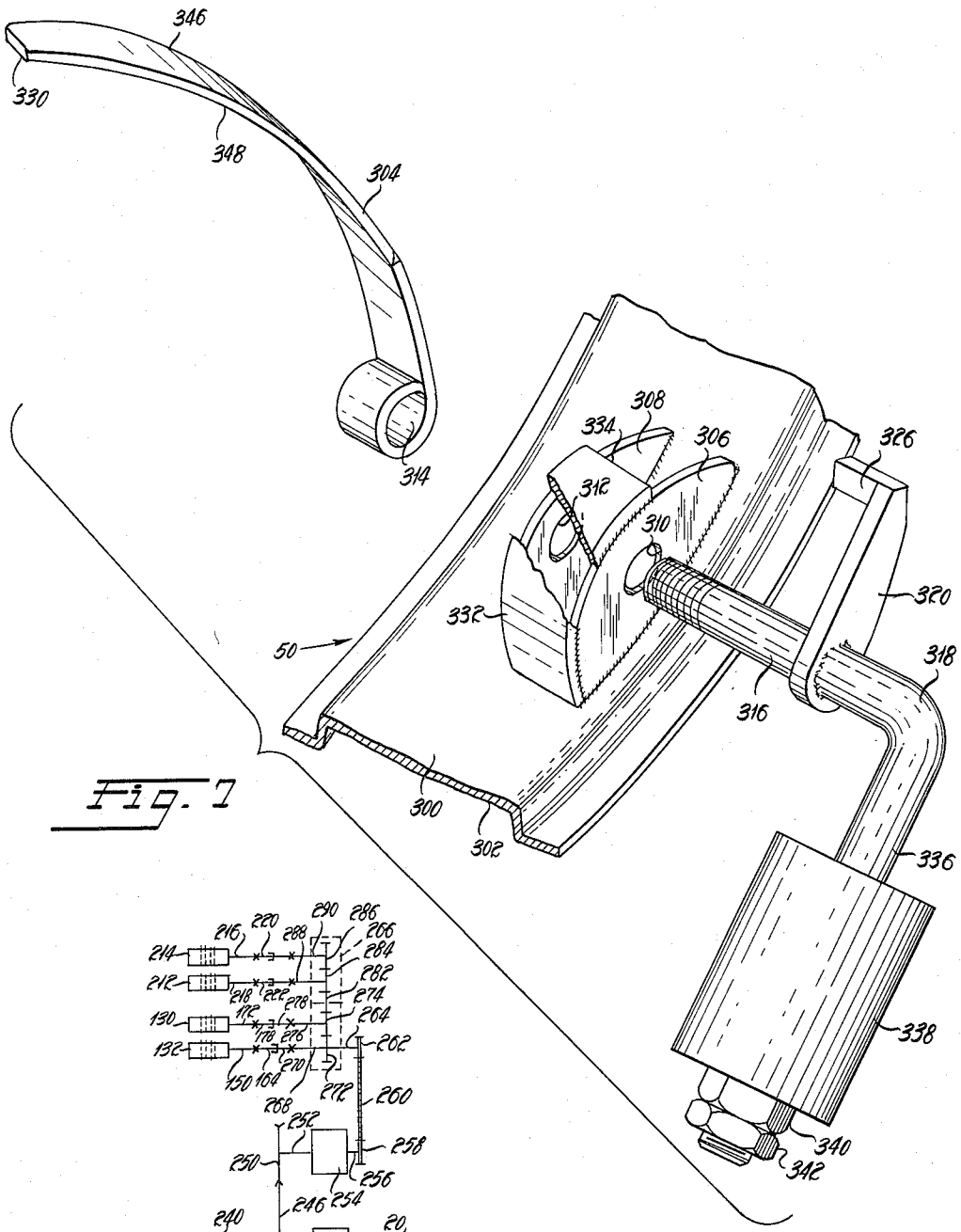


Fig. 7

Fig. 8

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DEBARKING MACHINE

Filed Sept. 4, 1959 4 Sheets-Sheet 4

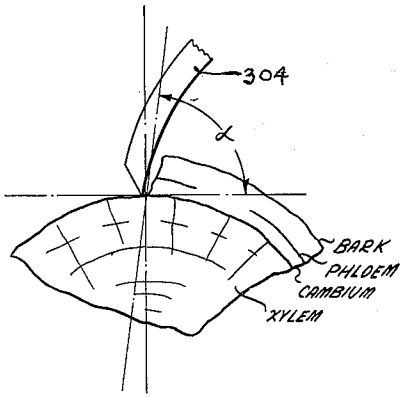


Fig. 10

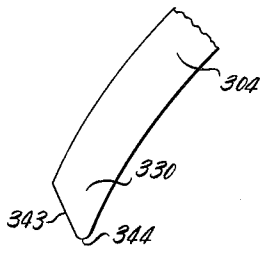


Fig. 11

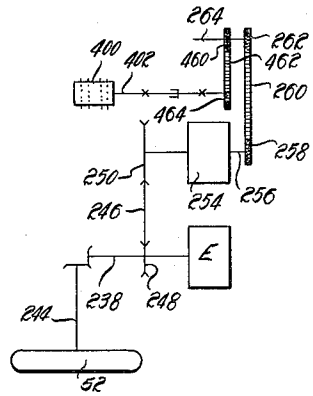


Fig. 14

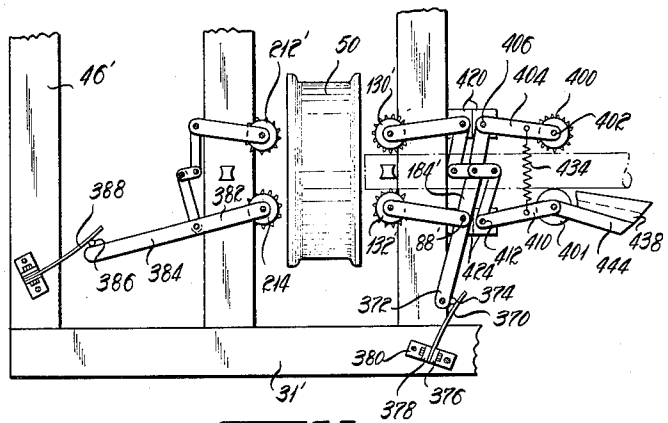


Fig. 12

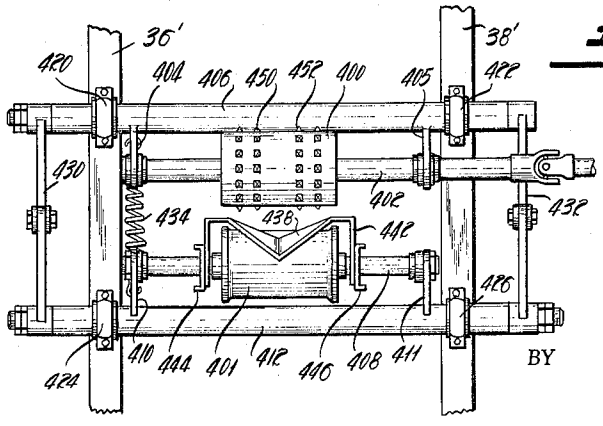


Fig. 13

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United States Patent Office

3,098,512

Patented July 23, 1963

3,098,512

DEBARKING MACHINE

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Filed Sept. 4, 1959, Ser. No. 838,210
11 Claims. (Cl. 144—208)

The present invention relates to improvements in post debarking machines of the kind having a rotatable drum with bark peeling members pivotally carried adjacent the periphery of the drum. It more particularly relates to a specific drum support and drive arrangement, blade mounting and actuating mechanism and the portable nature of the complete debarking machine.

Although peeling type debarking machines have been previously used, generally they require some relatively expensive or complex drive arrangement and the means for engaging and driving the post through the drum usually involves providing substantial pressure between the feed rolls and the logs which is not always compensated properly relative to the size and weight of the logs being peeled which, of course, effects the feed action of the feed rollers. Previously known devices have utilized centrifugally responsive weights which tend to vary the force of the bark peeling blades against a log being driven through the knife assembly drum. Insofar as is known, most of such centrifugally responsive devices utilize a resilient connection between the centrifugal weight and the blade member and, in some cases, this resilient connection is adjustable. Nevertheless, whether it is adjustable or not, the presence of such a resilient connection in a machine which is subjected to rugged, hard usage is just one other factor requiring shutdown and replacement. The more simple centrifugally responsive peeling blade construction of the present invention is an improvement over such prior art assemblies.

Although portability is normally merely a matter of reducing the size of an item and placing it on wheels or in some manner providing for its adaptability to easy transportation from location to location, in this instance portability has been found to be a very definite asset even within a mill yard, inasmuch as the debarking machine may be hauled by a tractor within the mill yard from pile to pile of unbarked posts and pulp logs, the tractor power in such case being readily available to furnish the power from one of its power takeoffs to drive the peeling drum and feed rollers of the portable debarking machine. Furthermore, the portable machine of this invention can be easily pulled by a small vehicle into a forest and the posts and poles debarked at the site of the cutting, leaving the bark chips spread on the forest floor to help replenish the forest land. Disadvantages of prior art debarking machines often resided in the complex drive trains which in many cases have utilized chain or belt drives in close proximity to the peeling drum. The primary disadvantage of chain and belt drives close to the peeling drum is that during operation bark chips fly and fall in the area immediately around the drum, often jamming in the chains or belts and causing machine breakdowns or shutdowns.

Previously known machines for debarking posts and poles, insofar as applicant is aware, generally cannot completely clean the post of the cellular membrane between bark and wood. Since this membrane is impervious to materials used in treating such posts, whenever the debarked post is to be treated the post must be subjected to a further operation to assure that all of the impervious membrane is removed. The machine of the present invention effectively removes all of the bark and the impervious membrane with negligible, if any, destruction of the wood under that layer.

Accordingly, a primary object of the present invention resides in the provision of a novel relatively simple yet extremely rugged post debarking machine.

A further object resides in the provision of a novel simple post debarking machine having common drive means to the peeling drum and feed rolls together with provision for independently controlling the transmission ratio to the peeling drum and to the feed rolls and having an input connection adapted to be connected to the power drive device.

A further object resides in a novel combination rotatable mounting and power transmission device for a debarking peeling drum assembly.

Still another object resides in the provision of a novel debarking peeling drum assembly with input and output feed roller devices mounted for self adjustment to the size of a post being fed into the machine. In conjunction with this object, it is a further object to provide multiple drive paths to the input and output feed rollers operable through a common transfer gear housing.

Another object resides in the provision of a novel drum type of post debarker in which the drum is rotatably mounted with resilient give in both an axial and radial sense relative to a normal axial and radial position.

A still further object in conjunction with the preceding objects resides in the provision of an equilateral rubber-tired drive wheel arrangement providing a position and rotatable mounting for a channel shaped annular rim on a debarking peeling drum assembly and wherein at least one of the rubber-tired wheels is drive connected through a transmission mechanism having an input connection adapted to be connected to a power driven device .

Still another object resides in providing a rotatable knife drum assembly having at least one bark peeling member movable toward and away from the surface of the log, the bark peeling member being centrifugally pressed against the log in response to centrifugal forces developed by rotation of the drum and having a counterbalance weight having a positive connection with the bark peeling member. In connection with this object, it is a further object to provide an abutment stop device on the drum for each of the bark peeling members adjacent their respective pivots and adapted to be abutted by an associated peeling member to prevent radial inward swinging movement of the bark peeling member to the axis of the drum so that a plurality of such bark peeling members cannot move into engagement with each other.

In connection with the preceding object, it is a further object to provide a curved blade, bark peeling member having one end pivoted on a dog leg shaft, one leg which is pivotally mounted on the inner periphery of a peeling drum rim parallel to the drum axis and its other leg extending transversely to a radius through the axis of the drum and having a counterweight slipped over and maintained in selectively adjustable position on the second dog leg, and an abutment plate member rigidly secured to the dog leg shaft and adapted to engage the outer side of and bias the peeling member inwardly when the drum is rotated and the counterweight develops centrifugal force.

A still further object resides in the provision of a novel preliminary infeed centering and guiding mechanism for posts being introduced to the primary infeed and guiding rollers, which adapts the debarking machine to an automated operation wherein a conveyor belt can feed logs into the machine.

Further novel features and other objects of this invention will become apparent from the following detailed description, discussion and the appended claims taken in conjunction with the accompanying drawings showing a preferred structure and embodiment, in which:

FIGURE 1 is a perspective view illustrating an embodiment of the portable debarking machine hitched to the rear end of a tractor, a part of which can be seen;

FIGURE 2 is a simplified side elevation view of the peeling drum and the three rubber rimmed mounting wheels, one of which is a drive wheel;

FIGURE 3 is a section view taken on line 3—3 of FIGURE 2;

FIGURE 4 is an enlarged detail view illustrating the input feed rollers in front of the peeling drum assembly, the weights being deleted from the drum for clarity;

FIGURE 5 is an enlarged detail view of the peeling drum assembly as seen from the front with the centrifugally responsive weights and peeling member actuators shown;

FIGURE 6 is a section taken on line 6—6 of FIGURE 5 illustrating the mounting of a bark peeling or removing member on the drum rim;

FIGURE 7 is a detail exploded perspective showing part of the peeling wheel, one blade and the associated centrifugal weight;

FIGURE 8 is a schematic view of the drive train illustrated in FIGURE 1;

FIGURE 9 (on sheet 2) is a section view through a weight illustrating its components and the manner in which it is assembled on a jig plate;

FIGURE 10 is a schematic illustrating the relationship between the blade peeling end and a post being peeled;

FIGURE 11 is an enlarged view of the blade peeling end to show the desired edge curvature;

FIGURE 12 is a schematic side view illustrating a second embodiment of the debarking machine in which a preliminary post centering mechanism is utilized ahead of the inlet feed and guide rollers, and in which leaf springs are used in lieu of coil springs to bias the feed rolls against the posts;

FIGURE 13 is a front detail view illustrating the preliminary feed roll, guide roll, trough and equalizer linkage; and

FIGURE 14 is a schematic view somewhat like FIGURE 8 illustrating the use of a small self contained engine on the portable machine and also illustrating a means to provide an additional drive takeoff for the preliminary centering feed roll.

Machine Chassis and Frame

With reference to the drawings, the portable debarking machine **10** is best illustrated in FIGURE 1 wherein the machine is illustrated as having its draw bar **12** coupled to the hitch (not shown) of a tractor **14**. Drive power for the debarking machine is furnished from a power takeoff at the rear of tractor **14** through a drive shaft **16** universally coupled by coupling **18** to an input stub shaft **20** on the portable machine **10**.

Debarking machine **10** consists of a base chassis **22** constructed of a series of longitudinal channel beams **24**, **26**, **27**, diagonal front end braces **28** and **29** and cross braces **30** and **31**. The middle longitudinal channel **12** extends completely through the chassis and its forward end constitutes the draw bar **12** for the portable debarker. Secured in a conventional manner under the chassis **22** is a straight axle (not shown) which rotatably journals ground engaging wheels **34**.

The front of the debarking machine is the side which faces the viewer in FIGURE 1 and is disposed at the right hand side of the machine chassis **22**. Extending in spaced apart and vertical relationship from the chassis channel **26** are two heavy channel members **36** and **38**. A pair of spaced apart intermediate vertical channel members **40** and **42** are vertically disposed on the middle chassis beam **24** and secured rigidly thereto as by welding. A rear set of spaced apart vertical channel beams **44** and **46** are rigidly welded to the rear longitudinal chassis channel **27** in alignment behind the front vertical channels **36** and **38**.

Peeling Mounting Assembly

A debarking peeling drum **50** is mounted with its axis horizontally disposed normal to the longitudinal chassis beams **24**, **26** and **27** and spaced essentially midway of the height of the vertical support beams **36–46**. The axis of drum **50** is located to extend midway between the spaced apart sets of vertical channel beams, and the drum **50** is rotatably maintained in a fixed position by cooperation between its channel rim and three equilaterally arranged rubber-tired wheels **52**, **54** and **56**. The drum **50** and the three wheels **52**, **54** and **56** are essentially co-planar and disposed in the space between the front vertical channels **36** and **38** and the intermediate set of vertical channels **40** and **42**. Wheel **52**, near the front of chassis **22**, constitutes a powered drive wheel and accordingly has its hub **58** secured in a conventional manner to the drive flange of a driving axle, to be later described. The other lower wheel **54** is an idler wheel rotatably mounted by conventional wheel bearings (not shown) on a non-driving axle which can be rigidly secured on top of and transverse to the center longitudinal chassis channel **24** by welding or by any conventional clamping device.

As can be seen in FIGURE 1, the peeling drum **50** has its annular periphery formed with a channel shaped cross section which fits over the treads of both the driving tire **60** and the tire **62** on idler wheel **54**. The upper idler wheel **56** is rotatably mounted on a fixed axle **64** which extends laterally midway between the intermediate vertical channels **40** and **42** and rear vertical channels **44** and **46**. Axle **64** is rigidly secured as by welding to support blocks **66** and to cross channels **68**, **69** and **70**. The two cross channels **68** and **69** are firmly clamped in a horizontal disposition to the intermediate set of vertical channels **40** and **42** by bolts **72**, whereas the rear horizontal cross channel **70** is secured by bolts **74** to the front flanges of the rear set of vertical channels **44** and **46**. These bolts can be secured in slots cut in the front flange of channels **44** and **46**, permitting vertical adjustment of the rear horizontal cross beam **70**. The two front cross beams **68** and **69** can be vertically adjusted by loosening the bolts **72**. In this manner, axle **64** of the upper idler wheel **56** can be vertically adjusted to provide pressure of its tire **76** against the drum **50** which equalizes against the driving wheel **52** and lower idler wheel **54**. Cooperation between the tires and the peeling drum rim maintains the drum in both axial and radial positions.

As illustrated, wheels **52**, **54** and **56** are conventional truck wheels carrying pneumatically inflated tires. It is to be understood that, in lieu of the tires **60**, **62** and **76**, solid rubber rims could be utilized on all three of the equilaterally arranged drum supporting and driving wheels. However, in such case the cushioning effect of the pneumatic tires on the peeling drum, in both an axial and a radial direction, would not be present. Specific details of the debarking drum and its plurality of peeling blade members will be described hereinafter, it being apparent at this point of the description that a log to be debarked is introduced coaxial through the drum **50** from the front of the machine shown in FIGURE 1.

Feed and Guide Mechanism

When a log is introduced into the debarking machine, an operator places the log on support roller **80** which has a channel shaped circumference tending to center any log placed thereon and headed in toward the peeling drum **50**. Support roller **80** is rotatably journaled on a stub axle **82** fixed in the end of a pivotally mounted lever arm **84** made of heavy channel beam. The rear end of arm **84** has a small plate **86** secured thereto as by bolts, plate **86** having an aperture therein which is pivotally disposed over the end of an equalizer shaft **88**, the equalizer shaft **88** in turn being pivotally mounted horizontally across the front flanges of the front set of vertical channel members **36** and **38** in pillow block bearings **90** and **92** bolted to the vertical channels **36** and **38**. Plate

86 is maintained on the end of shaft 88 by a collar 94 which is secured as by a set screw to the equalizer shaft 88. The support roller 80 and its mounting lever 84 are resiliently supported by a heavy coil tension spring 96, one end of which is hooked into a spring anchor 98 secured on the outside of vertical beam 36. The other end of spring 96 hooks into a length of a chain 100 having an end anchored in the support roller lever 84 adjacent its front end. When light weight logs are placed on the support roller 80 and rolled horizontally toward the debarking drum 50, they should be essentially coaxial with the debarking drum 50. When heavier logs are placed on the support roller 80, the spring force of coil spring 96 should be such as to permit a downward movement of lever 84 due to the weight of the log just enough so the heavier log will be maintained in a horizontal position essentially coaxial with the debarking drum 50. Although this type of preliminary support is inexpensive, the preferred preliminary infeed support is as shown in FIGURES 12 and 13, which will be later described.

As the leading end of a log is moved toward the debarking drum 50 it will engage between two lateral guiding rollers 102 and 104 having a concave cross section periphery. These two rollers 102 and 104 are spring loaded to the position illustrated in FIGURE 1 and the end of a log introduced between the two rollers will shift both of the rollers equally about an offset vertical support axis to permit passage of the log, while the force of the spring loading on rollers 102 and 104 and an equalizing linkage 105 will tend to maintain lateral centering of the log. As the log passes between these lateral guide rollers, the rollers move toward a position intermediate the toothed feed rollers (see FIGURE 3).

The support and spring loading mechanism for both of the two rollers 102 and 104 are identical and only one set will be described. Roller 102 is rotatably mounted on a vertical short stub shaft 106 which projects upwardly at the free end of a pivotally mounted lateral plate 108. Roller 102 is maintained on the stub shaft by means of a washer and a nut 110. The pivoted end of lateral plate 108 includes a vertical mounting shaft 112, the ends of which project through bearing collars (or pillow block bearings) 114 and 116 welded or bolted on the inside of the associated vertical beam 36. Shaft 112 is maintained axially in journaling position in the collars 114 and 116 by suitable collars 118 rigidly fastened to the projecting ends of the shaft 112 as by set screws.

Resilient biasing of the roller 102 is provided by a wire spring 120 which has two legs encircling upper and lower portions of shaft 112, a bight which engages the rear side of lateral plate 108, and two free legs which are disposed under a T-anchor 122 which is welded or otherwise secured to the front flange of vertical channel 36. As before noted, the roller 104 is mounted in an identical manner on the inside of the right hand front vertical channel 38. It is herein noted that an identical set of lateral guide rollers 124 and 126 are disposed between the intermediate vertical channels 40 and 42 providing lateral guide on the outlet side of the debarking drum 50, these two lateral guide outlet rollers 124 and 126 being mounted in a manner as described for roller 102. The equalizer linkage 105 (FIGURE 2) consists of horizontal bars 127 and 128 welded to the upper ends of lateral guide roller support shafts and having their adjacent ends articulatively connected by link plates 129.

Disposed behind the lateral inlet guide rollers 102 and 104, on horizontal axes midway between the front set of vertical channels 36 and 38 and the inlet side of the debarking drum 50, are two inlet feed and log gripping rollers 130 and 132, preferably of cylindrical shape. Each of these feed rollers 130 and 132 has plural rows of sharp steel teeth 134 rigidly secured in their periphery intermediate the ends of the rollers. The horizontal axes of each of the rollers 130 and 132 are respectively disposed equidistances above and below the axis of the debarking drum 50 and the rollers are journaled in an equalizing assembly, as will now be described.

The equalizing support for the input feed rollers 130 and 132 includes the aforenoted lower equalizer shaft 88 and an upper equalizer shaft 140 having its ends projected through and pivotally mounted in pillow blocks 142 and 144 secured to the front flanges of vertical channels 36 and 38 above the lower equalizer shaft pillow blocks 90 and 92. Two lever arms 146 and 148 are rigidly secured to the lower equalizer shaft 88 as by welding and extend rearwardly toward the debarking drum 50. The ends of these two lever arms 146 and 148 journal a horizontal lower input feed roll shaft 150 which is axially maintained in position by collars 152 and 154 disposed on the inner sides of lever arms 146 and 148 and secured as by set screws to the shaft 150. Intermediate the two lever arms 146 and 148, the feed wheel 132 is non-rotatably secured as by a spline disposed in the keyway 156. Feed roll 132 can be axially secured on shaft 150 by suitable set screw arrangements. As seen in FIGURE 4, the right hand end of feed roll drive shaft 150 projects beyond the vertical beam 38 and carries one half 160 of a universal fitting, the other half 162 being secured to the end of a driven shaft 164, as will be more fully described hereinafter.

The upper equalizer shaft 140 also has two rearwardly projected lever arms 168 and 170 rigidly secured thereto as by welding. The extremities of these two lever arms 168 and 170 rotatably carry the driving shaft 172 for the upper input feed roll 130, which shaft is axially maintained in the lever arms 168 and 170 in a manner similar to that previously described for the lower feed roll shaft 150. As seen in FIGURE 4, the right hand end of upper feed roll shaft 172 also terminates in one half 174 of a universal fitting, the other half 176 of which is secured to the end of a driven stub shaft 178. Rotation of the two shafts 164 and 178 in opposite directions results in opposite directional rotation of the two input feed rolls 132 and 130 and the feed roll teeth 134 will grip and drive a log, the end of which is introduced into abutment with the input side of the feed rolls. The teeth of these feed rolls also firmly grip the log and prevent rotation of the log as it enters the debarking drum 50.

As the log is drawn between the two feed rolls 130 and 132, the rolls must spread apart in order to accommodate varying diameters of logs which are being debarked. To accommodate this spreading apart of the two feed rolls, and still maintain a vertical relationship of the path of the log so the log will be introduced coaxially through the debarking drum 50, equalizing linkages interconnect between the two equalizing shafts 88 and 140. These linkages can be clearly seen in FIGURES 1 and 3, a set of these equalizers being disposed adjacent each set of ends of the two equalizer shafts. The equalizer set has one lever arm 182 rigidly secured to the end of the upper equalizer shaft 140 and depending downwardly and a second lever arm 184 rigidly secured to the end of lower equalizer shaft 88 and extending upwardly. The adjacent free ends of the two lever arms 182 and 184 are articulatively interconnected by a set of short link members 186 pivotally connected to the ends of the lever arms 182 and 184 by pins 188 and 190 respectively. Each equalizer set is identical to the one just described and will so interconnect the equalizing shafts 88 and 140 that any movement upwardly of the upper feed roll 130 must result in a similar downward movement of the lower feed roll 132.

To provide a strong resilient bias on the equalizing linkage tending to maintain the feed rolls biased toward each other with sufficient force to maintain a grip sufficient to force a log through the peeling drum 50, and also maintain the log against rotation, each of the upper lever arms 168 and 170 has forward extensions 192 and 194 rigidly secured thereto by welding, the extensions being bridged by a heavy plate 196 which is interconnected as

by a chain 198 to the forwardly extended end 200 of a heavy coil spring 202. The rear end of the heavy coil spring 202 has one of the coils clamped between two anchor plates 204 and 206 supported on a cross bar 208 having its ends rigidly secured to the upper ends of the front set of vertical channel beams 36 and 38, as by welding. The heavy nature of coil spring 202 tends to resiliently resist any downward bending deflection which will be caused if a log spreads the feed rolls 130 and 132 apart. Thus the teeth 134 of the two feed rolls will be firmly pressed into engagement with a log being fed into the debarking drum 50 by the resilient bias of coil spring 202. An alternative leaf spring biasing arrangement as shown in FIGURE 12 can be utilized if desired.

A similar biasing and equalizing arrangement is provided for a set of upper and lower outfeed rolls 212 and 214 which include drive shafts 216 and 218 respectively, connected through universal fittings to driven stub shafts 220 and 222 respectively. These two shafts 220 and 222 also have opposite directions of rotation arranged so that a log coming out of the rear of the debarking drum 50 and passing between the upper and lower outfeed rolls 212 and 214 will be engaged and driven between the intermediate vertical channel members 40 and 42. The log passes onto a support tray 224 which is mounted for limited pivotal movement on a rocking shaft 226 having its ends journaled in pillow blocks 228 rigidly secured as by bolts to the rear flanges of the rear set of vertical support channels 44 and 46. As a log is ejected from the rear of the debarking machine and slides over the tray 224, an operator will receive the completely debarked log and carry it to an appropriate stacking pile.

Drive Mechanism

As was briefly noted in the preceding description, one of the debarking drum mounting wheels 52 is power driven and the four input stub shafts 164, 178, 220 and 222 to the log feed and gripping rolls 130, 132, 212 and 214 are also power driven. To this end, a double transmission arrangement is provided as an integral part of the portable debarking machine. The aforenoted input stub shaft 20 to the debarking machine is a part of this power transmission and, as has been described, is connected, through universal fittings and drive shaft 16, to a power takeoff shaft on the rear end of tractor 14. It is to be understod that an engine or other power source (see FIGURE 14) could be mounted on the portable chassis, if desired, but so long as a tractor is used to move the machine, the tractor power takeoffs are readily available and reduce the cost of the debarking machine itself. On the other hand, if a small 4-cylinder gasoline engine is provided on the portable machine, it could be hauled into forests with small automotive vehicles which do not have auxiliary power takeoffs.

Referring to FIGURES 1 and 8, input drive shaft 20 is the input member to a primary change speed transmission 236 which can provide a straight through drive, neutral and several step down speed ratios to an output shaft 238. Output shaft 238 terminates in a pinion gear 240 which meshes with a ring gear 242 mounted coaxial with and drivingly connected to drive axle 244 for the peeling drum drive wheel 52. Ring gear 242 can be directly non-rotatably fastened on axle 244 or, as in the prototype of this machine, can be the ring gear on a conventional automotive differential in which one of the two axle drive gears is locked out and the other is splined to the drive wheel axle 244. In any event, the primary transmission 236 will directly control the speed of rotation of the peeling drum 50.

Primary transmission 236 will also indirectly control the speed of the log feed rolls 130, 132 and 212, 214 through a drive V-belt 246 which connects between a small diameter pulley 248, non-rotatably mounted on primary transmission output shaft 238, and a large diameter pulley 250 non-rotatably secured to shaft 252. Shaft 252 is the input shaft to a secondary transmission 254, which can also provide a straight through drive, several step down drive speed ratios, neutral and reverse to the feed mechanism. The secondary transmission output shaft 256 non-rotatably carries a chain drive sprocket wheel 258 which, through an endless chain 260, drives a sprocket wheel 262 secured on an input shaft 264 of a series of drive transfer gears which are mounted in a case 266. This second transmission enables reduced feed speeds and also permits reverse of the feed in the event the large end of a post jams the debarking drum. Note: the maximum rate of feed should be correlated with the drum rotaton so the feed distance which occurs during one revolution of the drum does not exceed the width of the blade peeling edge multiplied by the number of peeling blades.

The transfer case input shaft 264 projects through the case 266 and its other end 268 constitutes a drive connection for the lower input feed roll 132, connected through a universal coupling and shaft 270 to the stub shaft 164. Shafts 270 and 164 interconnect in a slidable splined fit. A gear 272 non-rotatable on transfer case input shaft 264 meshes with an identical gear 274 on a second output shaft 276 which is connected through a universal coupling to shaft 278. Shafts 278 and 178 interconnect in a slidable splined fit to provide a drive for upper input feed roll 130. The universal couplings and slidable fittings in the drive connections between transfer gear case 266 and the input feed rolls 130 and 132 permit the vertical shifting movement of the feed rolls to accommodate variations in sizes of logs being peeled. An idler gear 282 in transfer case 266 meshes with gear 274 and a third drive gear 284 which in turn meshes with a fourth drive gear 286. Gears 284 and 286 are identical in size and tooth number with transfer gears 272 and 274. Gear 284 is secured on an output shaft 288 to drive outlet feed roll 212 and gear 286 is secured on an output shaft 290 to drive outlet feed roll 214. The connections between shaft 288 and roll 212 and shaft 290 and roll 214 include universal couplings and slidable splined connections, as has been described for the input feed roll drive connections, to permit shifting of the outlet feed roll axes as they accommodate the changing diameters of the logs. Note, all feed rolls 130, 132, 212 and 214 will rotate at the same speed since the four gears 272, 274, 284 and 286 are identical, and the speed of the feed can be varied independently of the peeling drum speed by means of the secondary transmission 254. By using cylindrical feed rolls, the variations in diameters of posts being debarked will not effect the feed rate desired. Of course, it will be understood that the overall input drive speed can be varied by the speed at which the tractor engine is operated.

Peeling Drum

The peeling drum 50 is a unitary subassembly which, as has been described, is supported solely between the three rubber-tired wheels 52, 54 and 56 (FIGURES 1 and 2), of which wheel 52 is positively driven through the primary transmission 236. Sufficient pressure of the drive wheel tire 60 on the rim of drum 50 to assure a positive driving engagement can be provided by the aforedescribed vertical adjustment of the upper idler wheel 56.

Drum 50 is essentially a heavy steel rim 300, having its external peripheral surface provided with an annular channel 302 which receives the tread of the three rubber-tired wheels 52, 54 and 56, providing a confining track which cooperates with the wheels to maintain the peeling drum in an axial position between the input and outlet feed rolls.

Carried on the inner periphery of the drum rim 300 is a group of bark removing members or peeling blades 304. Peeling can be accomplished with one blade. However, it is preferable to have three or more equi-angularly spaced blades to aid in keeping the log centered in the

drum and for purposes of balance of the drum, the disclosed drum 50 including five such blades 304. Of course, it will be understood that, as the number of blades is increased, the feed rate can be increased without increasing drum rotation. FIGURES 5, 6 and 7 illustrate the peeling blades 304, their mounting arrangement and the coaction of the centrifugally responsive weight assemblies with each blade, and FIGURES 10 and 11 show further blade details.

Each blade 304 is pivotally secured at one end to the inner periphery of rim 300 and to provide such mounting, a pair of axially spaced apart, apertured, steel plate ears 306 and 308 are secured by welding to the inner side of rim 300 for each blade 304. The apertures 310 and 312 (FIGURE 7) respectively, in the two ears 306 and 308 are aligned and the axis of alignment is parallel to the drum axis. Blade 304 is a curved tempered steel strip, the blades in the prototype being made from leaf spring material, with a pivot mounting eye 314 rolled in its outer end and has a width dimension at the pivoted end enabling a free close fit of the eye 314 between the ears 306 and 308 where it is pivoted on one leg 316 of a 90° dog leg shaft 318. Leg 316 projects through aperture 310 in the front ear 306, through the blade eye 314 and through the aperture 312 in rear ear 308.

Shaft leg 316 is axially positioned in the ears 306 and 308 by engagement of a blade abutment fitting 320, which is welded on leg 316 adjacent the bend of shaft 318, with the front side of ear 306. A nut 322 and lock nut 324 (FIGURE 6), threaded on the end of shaft leg 316 maintain the shaft in a free fitting pivotal disposition in the two ears. Blade abutment fitting 320 extends transverse to the shaft leg 316 to a position adjacent the peeling blade 304 and terminates in a lug 326 which projects behind the outer side of the blade 304, as best shown in FIGURES 5 and 6.

In the non-operating position of the peeling blades 304, their peeling end edges 330 may be disposed approximate but not quite on the drum axis (FIGURE 5). This limit position is determined by a small curved strip of steel plate 332 (FIGURE 7) welded to the ears 306 and 308 and having an abutment edge 334 adapted to engage the inner surface of blades 304 adjacent its eye 314 when the blades 304 reach their inner position, as in FIGURE 5. These stops 332 prevent the peeling end edges from engaging and possibly locking and becoming dulled when no log is passing through the drum 50. In this non-peeling position of the blades 304, the other leg 336 of dog leg shaft 318 is inclined approximately thirty (30) degrees outwardly of tangency to the rim 300 with the blade abutment lug 326 in engagement with the blade 304. Disposed on the dog-leg shaft leg 336 is an apertured weight member 338 whose position relative to the pivot leg 316 can be varied by adjusting a nut 340 and lock nut 342 threaded on the end of leg 336. With such an arrangement, rotation of the drum 50 causes centrifugal force to act on weights 338, tending to pivot the dog leg shafts 318 counterclockwise, and biasing the blades 304 inwardly by engagement between the abutment lugs 326 and blades 304. When a log has been inserted into the drum 50 and the blades 304 pivot outwardly, the weights 338, depending upon the size of the log, will be swung inwardly to a point preferably where the shaft leg 336 is approximately tangent to the rim, at which location essentially all of the centrifugal force developed by the weights about the shaft pivot leg 316 will be applied through the moment arm provided by the dog leg lever to force the blades 304 inwardly. The structural correlation between the dog leg arm 336 and the blade engaging lug 326 should not be such as to permit the weight to swing inward beyond a position where it would be overbalanced by the centrifugal forces on the blade 304, and to this end, an adjustable fitting can be provided between the abutment member 320 and shaft leg 316 so the relationship can be varied for use with batches of different sized logs being debarked.

Peeling blade 304 has its inner end 330 formed with a bevel 343 terminated in edge 344 (see FIGURE 11) which is disposed substantially parallel with the drum axis and is narrower than the width of blade 304 at its eye 314. The blade 304 is curved from peeling end 330 toward the eye 314 in the direction of drum rotation (see FIGURE 5) and the curvature is such that the inside portion of each blade 304 immediately adjacent the peeling edge 330 forms an angle α (FIGURE 10) and is approximately radial (90°) to the axis of drum 50 when the blades are in a position to peel a post approximately 3–4 inches in diameter. This relationship becomes slightly inclined toward the direction of rotation when larger diameter logs are being peeled. However, for the most satisfactory operation, the angle α should not be obtuse and should be as close to 90° as practicable, although larger diameter logs have been satisfactorily peeled when the angle α approximates 60°. The rear edge 346 of blade 304 is straight (FIGURE 6), whereas the front edge 358 inclines from end edge 330 toward the front of drum 50 in the direction of rotation and is beveled as shown in FIGURE 6. This inclination and beveling of the front edges 348 of blades 304 is not necessary but may aid somewhat in a more rapid climbing of the blades 304 to the periphery of a post when rotating in the non-operative position of FIGURE 5 and the end of a log is introduced into abutment against the front edges of the blades.

FIGURE 11 illustrates, in enlarged detail, the nature of the actual peeling edge 344 of blade 304. It is not a knife edge, which would tend to scrape and splinter the wood cells of the post, but is ground to a small curvature permitting the blade to ride smoothly over the wood cells yet, at the same time, peeling and scraping all bark and all portions of the impervious membrane layer away from adjacent the wood cells. As an example, in the prototype machine, blades 304 were made from automotive leaf spring approximately ¼ inch in thickness, the bevel 343 was approximately forty-five degrees and the radius of curvature of edge 344 was approximately $\frac{1}{32}$ inch.

The even angular spacing of the blades 304 tend to hold the log centered in the drum 50 and the peeling edges 330 of the rotating blades 304 will scrape all of the bark off the log with minimum damage to the wood as the input feed rollers 130 and 132 force a log through the drum and outlet feed rollers 212 and 214 complete the feed movement. The resilient nature of the spring leaf blades 304 prevents splintering and tearing of the wood cells around knots in a log, which destructive splintering does occur in debarker machines which use heavy and/or rigid blades. If the bark is hard to remove, depending upon the type of log and/or weather conditions, the speed of the drum can be increased by increasing the speed of the tractor engine or by changing the transmission 236, at the same time decreasing feed roll speed by means of the secondary transmission 254. If desired, springs can be added between the weights 338 and rim 300 to keep the blades inward when not rotating and also to aid the centrifugal forces on the weights.

Blade weights.—It is quite important for smooth and trouble free operation of the debarking drum that the masses of the blades, the weights and their structural connections be accurately positioned for proper balance about the axis of the drum 50, and in this connection, a relatively simple method to make accurate weights 338 was devised. FIGURE 9 illustrates the use of a weight fabricating jig 350 made from a flat metal block with a machined annular depression 352 in one face providing a central pilot boss 354 and a concentric annular shoulder 356 at the outer edge of depression 352. A short length of a small diameter pipe 358 is spigoted snugly over the pilot boss 354 and a similar length of

larger diameter pipe 360 spigoted within the annular shoulder 356. This arrangement assures substantial concentricity of pipes 358 and 360 and while so positioned in jig 350, the space between the two pipes is filled with molten lead 362. When the lead 362 hardens, the inner pipe 358 is reamed, or bored, to a desired accurate size permitting a slip fit of the weight 338 on the leg 336 of dog leg shaft 318.

Modified Feed and Power Mechanism

FIGURES 12, 13 and 14 illustrate a modified form of the debarking machine in which the heavy overhead coil spring 202 (FIGURE 3), used to bias the inlet feed rollers, has been replaced by a leaf spring 370 secured to the lower portion of the machine. The essential difference in the inlet feed roll equalizing linkage is that lower links 184' (corresponding to links 184) which are rigidly secured to lower feed roller pivot shaft 88', have extended lower arms 372 and a round rod 374 is rigidly secured to bridge the extremities of lower arms 372. Rod 374 constitutes an abutment for the free end of leaf spring 370 which is flexed to exert a force on the feed roller equalizing linkage tending to bias the upper and lower feed rollers 130' and 132' toward each other.

The fixed end of spring 370 is clamped between a block 376 and a flange 378 of a mounting bracket 380 rigidly secured to lower frame beam 31'. When larger diameter, and hence heavier, logs pass between the feed rollers 130' and 132' the movement of the equalizer linkage shifts the spring abutment rod 374 a greater distance against leaf spring 370 to deflect spring 370 a greater distance which increases the spring bias to affect the added weight of the log. One advantage of this modified spring arrangement is that the weight of the log, which is applied through the lower roller, is now applied directly through the lower roller support to the spring without going through the entire equalizer linkage.

A similar leaf spring arrangement is provided for the outlet feed rollers 212' and 214', wherein the lower lever arms 382 have rearward extrusions 384 bridged by a cross rod 386 which flexes a leaf spring 388 clamped to one of the rear vertical frame channels 46'.

This latter embodiment includes a preliminary post centering feed device in lieu of the support roller 80 used in the FIGURE 1 embodiment. As clearly illustrated in FIGURES 12 and 13, the centering device includes an upper toothed roller 400 and a lower spool shaped roller 401. The upper toothed roller 400 is non-rotatably secured to a driven shaft 402 and journaled in the ends of forwardly extended lever arms 404 and 405 which are rigidly secured, as by welding, to a rock shaft 406, while the lower spool shaped roller 401 is rotatably journaled on a shaft 408 which is rigidly secured in the ends of forwardly extended lever arms 410 and 411 which in turn are rigidly secured, as by welding, to rock shaft 412.

To provide pivot journalling for the two rock shafts 406 and 416, immediately ahead of the corresponding rock shafts for the inlet feed rollers 130' and 132', sets of double pillow block bearings 420, 422, 424 and 426 are provided on the front vertical columns 36' and 38' in lieu of the single pillow block bearings 142, 144, 90 and 92 shown in FIGURE 4. Each end of the rock shafts 406 and 412 are interconnected by equalizing linkages 430 and 432, offset outwardly from the vertical channels 36' and 38' a distance sufficient to clear the equalizing linkage of the inlet feed rollers (omitted from FIGURE 13 for clarity). Equalizing linkages 430 and 432 operate in precisely the same manner as do the previously described feed roll equalizing linkages, assuring that the centering rolls 400 and 401 will move in conjunction to accommodate posts of varying diameters and maintain the axis of any size post in an essentially centered relationship relative to the debarking drum 50'. The two centering rollers are biased toward each other by a coil tension spring 434 having sufficient force to maintain the toothed roller 400 in at least a light drive engagement with a post inserted between rollers 400 and 401.

Immediately ahead of the free spool shaped roller 401 is a V-shaped trough 438 having side flanges 440 and 442 welded to respective beams 444 and 446, which in turn are rigidly secured, as by welding, to the non-rotatable shaft 408. The trough 438 will thus shift downwardly upon separatory movement of the two preliminary centering rollers 400 and 401 when any post is inserted therebetween.

As will be apparent from the showing of FIGURE 13, if the end of a post of any diameter capable of going through the debarking drum is placed into the trough 438, the side walls of the trough will center the end of the post relative to the center line of the debarker drum and as the post is shifted into the machine, it will be engaged by the center rows of steel drive teeth 450 and 452 of the upper roller 400. These two rows 450 and 452 of gripping teeth are spaced slightly further apart than the teeth of the regular feed rollers and tend to maintain a laterally centered relationship as the post is drawn between rollers 400 and 401 by powered rotation of upper roller 400. As soon as the post enters between the two rollers 400 and 401, they separate and in so doing the guide trough 438 is lowered away from engagement with the post so the post will roll on the lower spool roller 401.

Drive power is imparted to rotate the upper roller 400 at the same rotational speed as the primary feed rollers are rotated, through universally connected drive fittings similar to those described for the feed rollers. FIGURE 14 illustrates one way in which drive power is imparted from shaft 264 through an auxiliary drive sprocket wheel 460, sprocket chain 462 and driven sprocket wheel 464. Sprocket wheel 464 is connected through universal fittings and a slip joint to roller shaft 402 in the manner described for each of the feed rolls illustrated in FIGURE 8.

This preliminary centering device offers several distinct advantages over the single support roll embodiment. It overcomes the need for an operator to force the post between the inlet lateral guide rollers. No effort is required on the part of an operator to guide the post into the feed rollers which are quite a distance from the support roller. It eliminates the need for the operator to continue to hold the post as it passes through the inlet feed rollers, the drum, and into engagement with the output feed rollers. Also, and of considerable importance, is the fact that such a preliminary centering and guide device enables the debarking machine to be used in an assembly line arrangement in which a conveyor belt can feed a post lengthwise into the centering trough 438 and the machine will automatically accept and debark the post.

Referring again to FIGURE 14, it will be noted that the primary change speed transmission 236 and input shaft 20 (of FIGURE 8) have been replaced by an auxiliary engine E, to illustrate schematically how such modification, which has been previously referred to, can be easily accomplished. In using an auxiliary engine modification, the primary change speed transmission can be omitted and variation in throttle control over the speed of the engine can be used to vary the speed of rotation of the peeling drum, the feed speed rate being varied by means of the previously referred to secondary transmission.

The foregoing description discloses an operative portable debarking machine with a relatively simple selectively variable drive train to the peeling drum and to the feed rolls. It also discloses a simple, reliable and extremely rugged combined drive and mounting arrangement for a peeling drum assembly and improved direct acting centrifugally responsive elements for creating debarking forces on the peeling blades of a peeling drum.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and

not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A post debarker comprising: a frame structure; at least three wheels journalled on said frame structure disposed with their axes in spaced apart parallel relationship arranged substantially equilaterally with the wheels in a co-planar relationship; a bark peeling blade assembly comprising a channel rimmed drum rotatably supported and axially positioned solely by engagement of its rim with each of said plurality of wheels, a plurality of peeling blades pivotally mounted on the said drum and having centrifugally responsive means engaging each of said blades providing a centrifugal biasing force upon rotation of said drum tending to force said blades toward the center of said drum; means comprising portions of said wheels and said drum rim providing resilience in the axial and radial positioning of said drum; means including at least one of said wheels for rotating said drum; and means on said frame structure for guiding and driving a log through the center of said drum.

2. A portable post debarker comprising: a wheeled base frame; a vertical support structure; at least three rubber rimmed wheels disposed with their axes in spaced apart parallel relationship arranged substantially equilaterally with the wheels in a co-planar relationship; a bark peeling blade assembly comprising a flanged rim drum rotatably supported solely by engagement with each of said plurality of rubber rimmed wheels, a plurality of curved peeling blades with inclined leading edges having one end pivotally mounted adjacent the periphery of said blade assembly drum, and centrifugally responsive means engaging each of said blades and providing a centrifugal biasing force upon rotation of said drum tending to force said blades toward the center of said drum; log guide means fore and aft of said blade assembly; log driving means including equalizer means to automatically vertically center the log, fore and aft of said blade drum assembly; lateral log guiding rollers spring biased toward each other and adapted to engage a log as it enters the front of said rotating blade assembly and as it exits from the rear of said rotating blade assembly; transmission means mounted on said frame providing drive power to said log driving means and to at least one of said wheels; and means on said transmission means adapted to be connected to a power source.

3. A post debarker comprising: a support; a rotating peeling drum assembly mounted on said support for rotation about a horizontal axis and having peeling blades with cooperating centrifugally responsive members tending to force said blades inwardly toward the center of said drum assembly; upper and lower toothed post driving rolls on horizontal parallel axes disposed forwardly of said rotating drum assembly and adapted to guide a post essentially coaxially into said rotating drum assembly; a rear set of toothed post driving rolls on horizontal parallel axes disposed rearwardly of said rotating drum assembly and adapted to receive a post from said drum assembly essentially coaxial of said drum assembly; power transfer means on said support connected to and adapted to drive said fore and aft sets of rolls at a similar rate of speed; spring biased equalizing means mounting said rolls on said support whereby the two rolls of each set can be spread vertically apart to automatically accommodate various diameter posts and still maintain a vertically centered relationship of said post to said drum assembly; at least two sets of concave guide rolls for lateral guiding of a post, a set disposed in front and a set disposed in back of said drum assembly; spring means connecting and biasing the lateral guide rolls of each set toward each other; and equalizer means carried by said support and mounting each said set of lateral guide rolls whereby the two rolls of each set can be spread laterally apart to automatically accommodate various diameter posts and still maintain a horizontally centered relationship of said post to said drum assembly.

4. A post debarker comprising: a frame structure; at least three pneumatically tired wheels journalled on said frame structure disposed with their axes in spaced apart parallel relationship arranged substantially equilaterally with the wheels in a co-planar relationship; a bark peeling blade assembly comprising a drum rotatably supported and axially positioned solely by engagement with each of said plurality of tired wheels, a plurality of peeling blades pivotally mounted on the said drum and having centrifugally responsive means engaging each of said blades providing a centrifugal biasing force upon rotation of said drum tending to force said blades toward the center of said drum; means on said frame structure for rotating said drum; and means on said frame structure for guiding and driving a post through the center of said drum, comprising toothed feed rollers in front of and behind said drum.

5. A post debarker as defined in claim 4 wherein a preliminary post centering means for guiding and forcing a post into said feed means is mounted on said frame structure in front of said peeling blade assembly and said means for guiding and driving a post through said drum.

6. A post debarker as defined in claim 5, wherein said preliminary centering means comprises a V-shaped trough to initially receive and center a post, equalized preliminary feed and support rollers and means to lower the trough from engagement with a post when the post end enters between the preliminary feed and support rollers.

7. A rotating post peeling drum assembly adapted to be rotatably mounted and driven in a post debarking machine, comprising: a circular rim; a plurality of curved peeling blades having one end pivotally mounted adjacent the periphery of said rim and each of said blades curving inwardly opposite to the direction of rotation and terminating in a beveled dull edge essentially parallel to the axis of rotation of said rim; the leading edge of the curved portion of each blade being inclined from the front of the drum toward the rear and inwardly; and means adapted to engage each blade adjacent its pivot point comprising a plurality of centrifugally responsive means, each said centrifugally responsive means comprising an adjustable weight, a pivot shaft mounting said weight and pivotally connecting an associated one of said peeling blades to said rim, and a blade abutment member rigidly secured to said pivot shaft and adapted to transfer a biasing force from the pivot shaft to said associated blade tending to force the blade inwardly toward the axis of said rim upon development of centrifugal forces in said weights during rotation of said rim.

8. A post debarker comprising: a support structure; a bark peeling blade assembly comprising a rotatable drum, a plurality of peeling members carried by said drum and means creating a biasing force tending to force said blades toward the center of said drum; resilient cushioning means for rotatably and axially positioning said drum; means for radially driving said drum; and means for non-rotatably driving a post through the center of said drum; said drum having a channel shaped rim and said drum positioning means and driving means comprising at least three co-planar, pneumatically tired, equilaterally spaced wheels journalled on said support structure surrounding said rim with the wheel tires frictionally engaging in the channel of said rim and axially and rotatably radially positioning said drum rim, with means to power rotate at least one of said wheels.

9. A post debarker comprising: a support structure; a bark peeling blade assembly comprising a rotatable drum, a plurality of peeling members carried by said drum and means for creating a biasing force on said peeling members tending to force said peeling members toward the center of said drum; resilient cushioning means carried

by said support structure and rotatably mounting said drum with limited radially resilient give and limited axially resilient give of said drum relative to said support structure, said cushioning means engaging and radially and axially positioning said drum at least at three equally spaced apart positions around said drum; means, carried by said support structure and engaging said drum for rotatably driving said drum; and means carried by said support structure for non-rotatably driving a post through the center of said drum; each of said peeling members being a blade made of leaf spring steel and constituting a spring leaf.

10. A post debarker comprising: a support structure; a bark peeling blade assembly comprising a rotatable drum, a plurality of peeling members carried by said drum and means for creating a biasing force on said peeling members tending to force said peeling members toward the center of said drum; resilient cushioning means carried by said support structure and rotatably mounting said drum with limited radially resilient give and limited axially resilient give of said drum relative to said support structure, said cushioning means engaging and radially and axially positioning said drum at least at three equally spaced apart positions around said drum; means carried by said support structure and engaging said drum for rotatably driving said drum; means carried by said support structure for non-rotatably driving a post through the center of said drum; and preliminary post centering means mounted on said support structure in front of said drum and said means for driving a post through said drum for guiding, centering and forcing a post into said post driving means.

11. A post debarker comprising: a support structure; a bark peeling blade assembly comprising a rotatable drum, a plurality of peeling members carried by said drum and means for creating a biasing force on said peeling members tending to force said peeling members toward the center of said drum; resilient cushioning means carried by said support structure rotatably mounting said drum and resiliently radially and resiliently axially positioning said drum; means carried by said support structure and engaging said drum for rotatably driving said drum; means carried by said support structure for non-rotatably driving a post through the center of said drum comprising separable driven toothed rollers ahead of said drum and resiliently loaded equalizing means mounting said toothed rollers to permit equalized separation as a post feeds therebetween; and preliminary post centering means mounted on said support structure in front of said drum and said means for driving a post through said drum for guiding, centering and forcing a post into said post driving means comprising a set of separable rollers and a V-shaped trough disposed ahead of said feed rollers with at least one of said preliminary rollers being a driven toothed roller, and resiliently loaded equalizing means mounting said preliminary rollers to permit equalized separation of said rollers as a post passes therebetween.

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