Oct. 12, 1954 D. J. YEADON ET AL 2,691,395

METHOD AND APPARATUS FOR STRIPPING BARK

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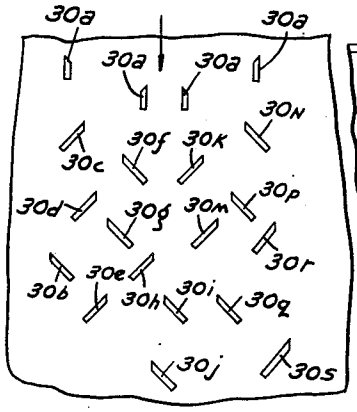


FIG. 9

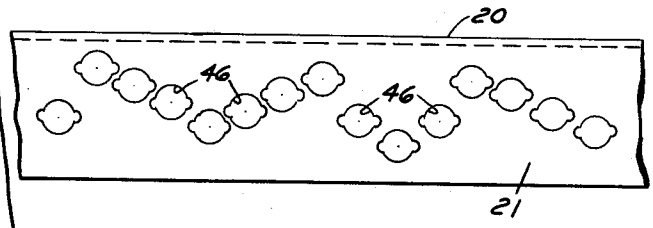


FIG. 10

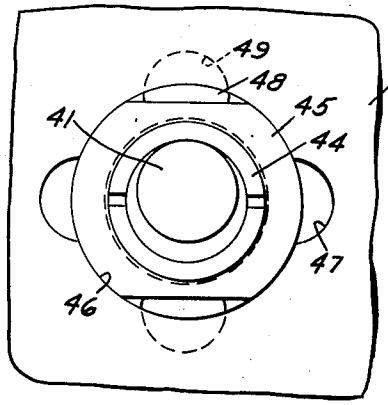


FIG. 7

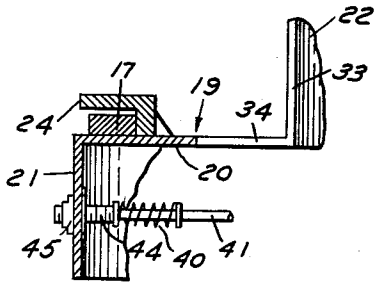


FIG. 8

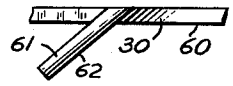
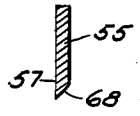


FIG. 13



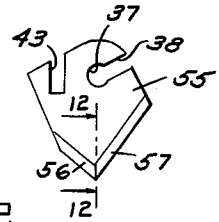
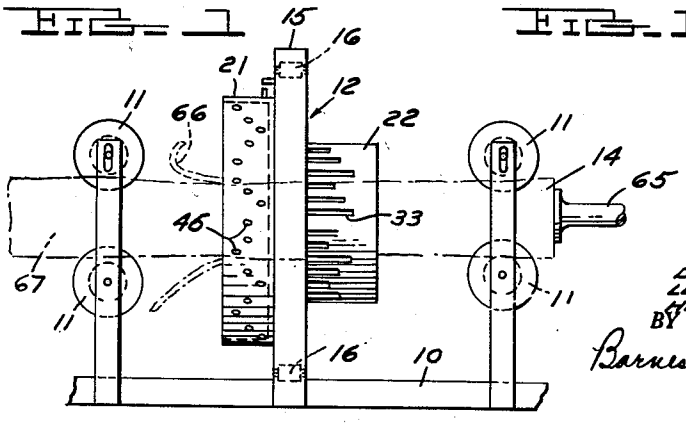


FIG. 12

FIG. 11

FIG. 1



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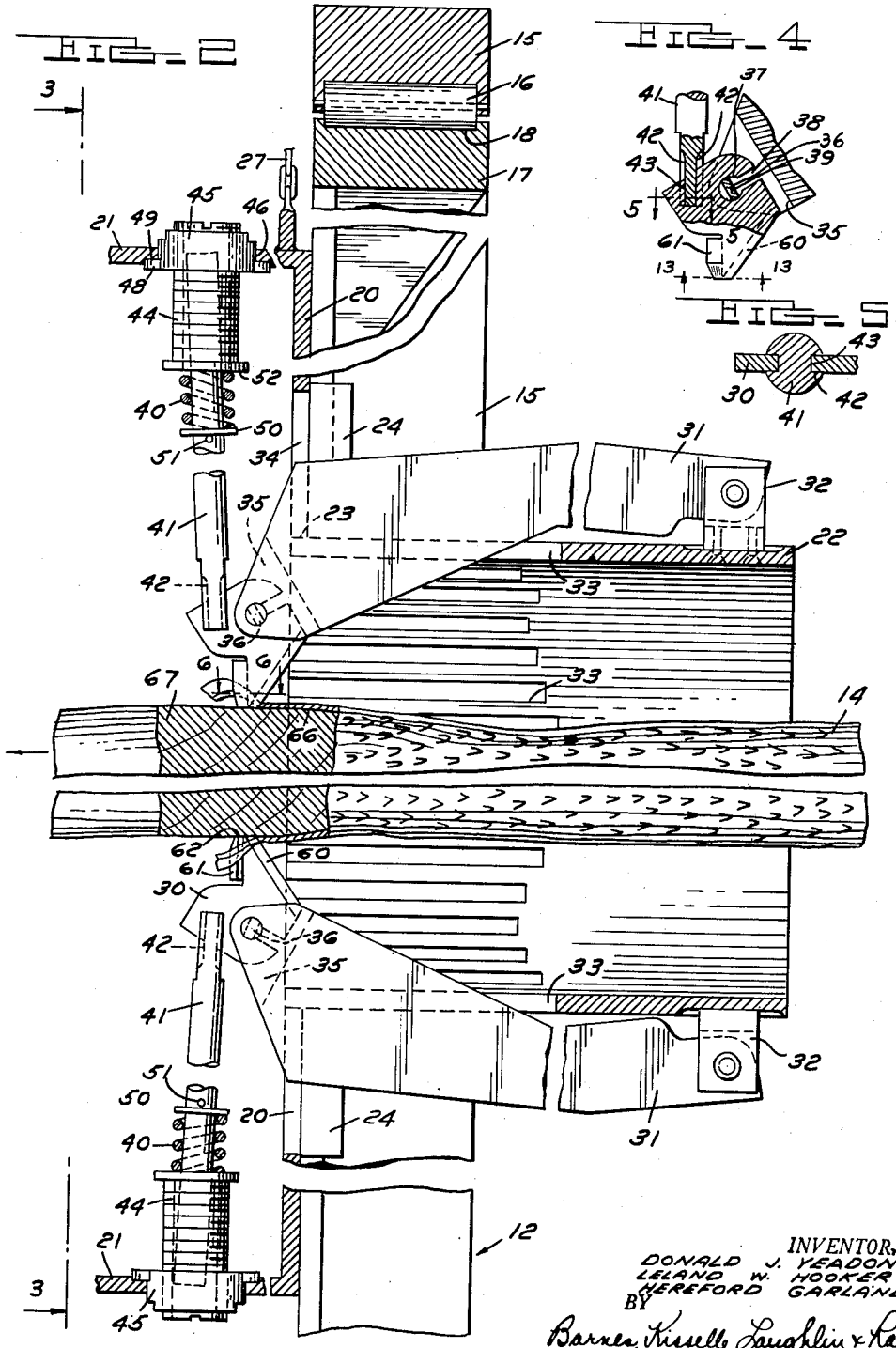
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METHOD AND APPARATUS FOR STRIPPING BARK

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FIG. 3

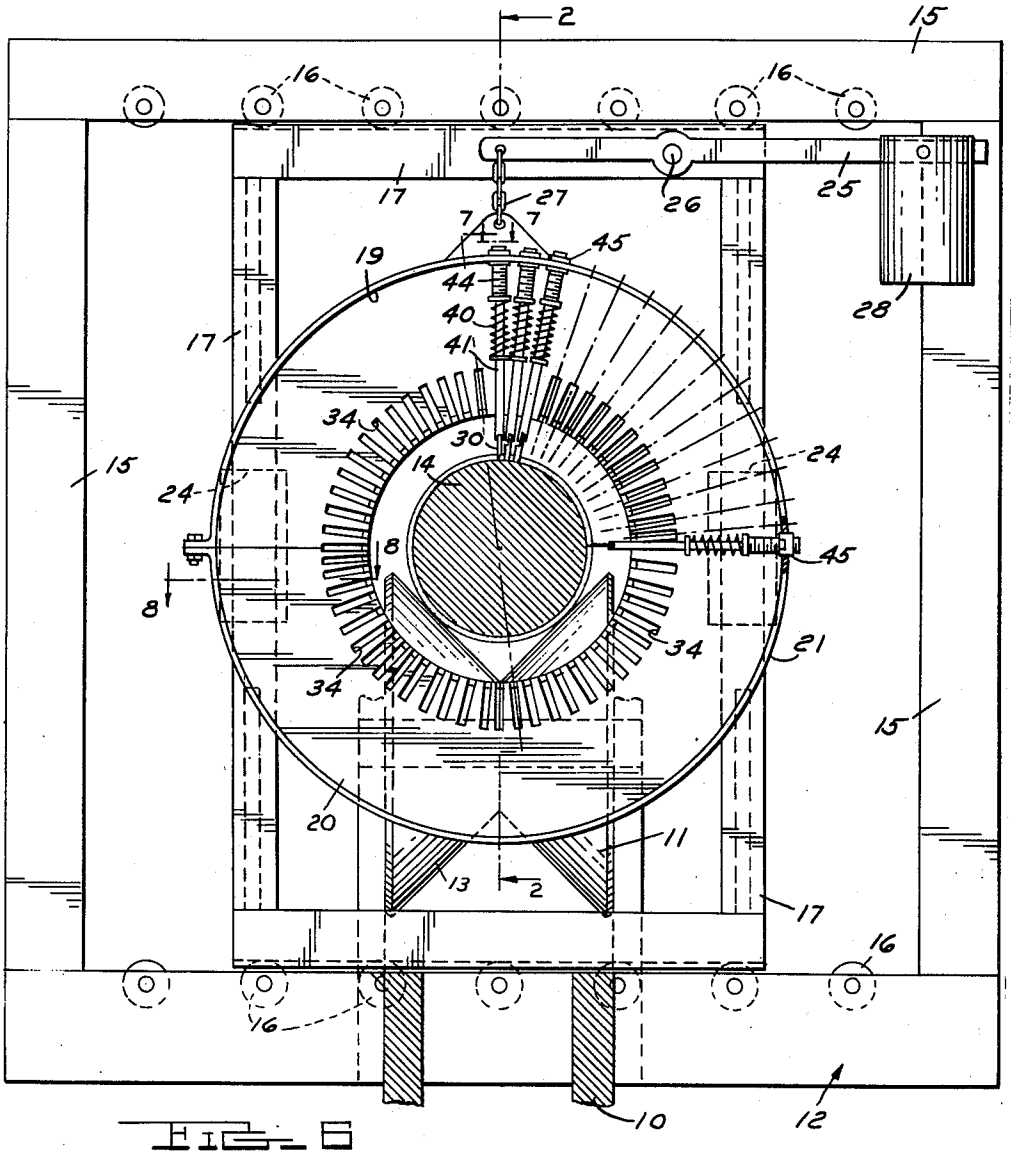
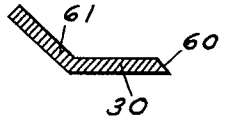


FIG. 6



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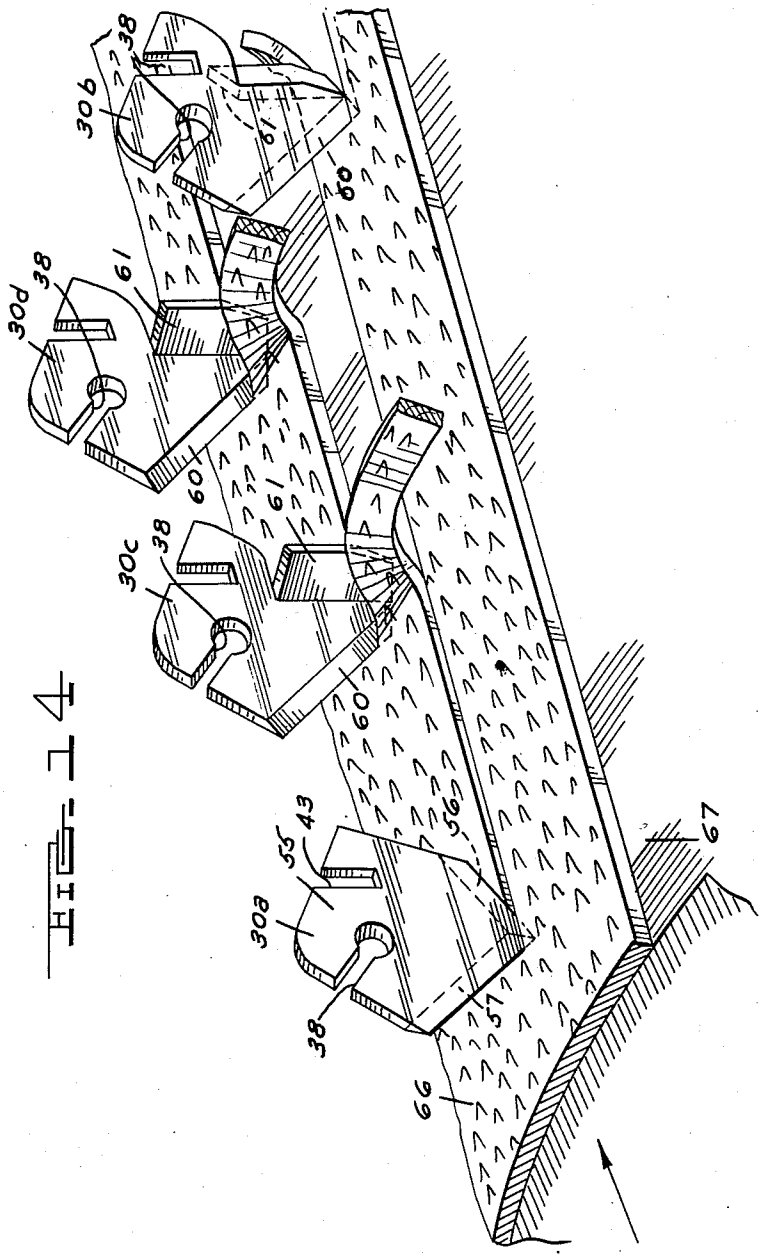


FIG. 7 4

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METHOD AND APPARATUS FOR STRIPPING BARK

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Application July 26, 1951, Serial No. 238,602

24 Claims. (Cl. 144—208)

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This invention relates to a method and apparatus for removing bark from logs.

It is the object of the invention to produce a method of peeling the bark from a log, such as a pulpwood stick, which requires the application of a minimum amount of energy, a relatively simple machine, and which is very economical from the standpoint of the loss of wood.

More specifically, the invention contemplates a method of peeling bark from a log which, in its broader aspects, consists of first overcoming the cohesive forces within the bark itself by slitting the bark and thereafter overcoming the adhesion between the bark and the wood by displacing the cut strips of bark sidewise. The apparatus for carrying out the process generally comprises several echelon formations of knives arranged in the form of a ring and spring mounted for radial movement to accommodate logs of different sizes and crooked logs, each knife also being spring loaded to permit it to ride over branch stubs and other irregularities on the surface of the log. The knives are provided with wedge-shaped cutting faces such that, as the knives cut through the bark, they also wedge or displace the bark sidewise or circumferentially of the log and thereby effect a complete separation of the bark from the wood.

In the drawings:

Fig. 1 is a generally diagrammatic view of the bark-peeling machine of this invention as viewed in side elevation.

Fig. 2 is a sectional view through the line 2—2 in Fig. 3.

Fig. 3 is a sectional view through the line 3—3 in Fig. 2.

Fig. 4 is a fragmentary view, partly in section, of the knife blade mounting assembly.

Fig. 5 is a sectional view taken along the line 5—5 in Fig. 4.

Fig. 6 is a sectional view of one of the stripping knives taken along the line 6—6 in Fig. 2.

Fig. 7 is a fragmentary sectional view taken along the line 7—7 in Fig. 3.

Fig. 8 is a fragmentary sectional view taken along the line 8—8 in Fig. 3.

Fig. 9 is a diagrammatic view illustrating the echelon arrangement of the knives.

Fig. 10 is a diagrammatic view showing the echelon formation of guide holes on the knife supporting ring.

Fig. 11 is a side view of the lead knife.

Fig. 12 is a sectional view taken along the line 12—12 in Fig. 11.

Fig. 13 is a bottom view of a trailing knife as seen from the line 13—13 in Fig. 4.

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Fig. 14 is a perspective view illustrating the manner in which one group of knives operates to strip bark from a log.

Referring to the drawings it will be observed that the machine includes a base 10 on which are mounted two pair of log guide rolls 11 and a knife head 12 between the two pairs of rolls 11. Rolls 11 are V-shaped as indicated at 13, the upper roll in each pair being vertically movable to accommodate logs or pulpwood sticks 14 of various sizes.

The head 12 of the machine includes a generally rectangular frame member 15 provided with rollers 16 along the upper and lower horizontal runs thereof which support a second frame member 17 for rolling movement laterally of frame 15. Frame 17 is fashioned with guides 18 for receiving rollers 16. Frame 17 in turn supports a knife mounting ring 19, which as illustrated in Figs. 2 and 3 is fashioned as a centrally apertured annular plate 20 provided with a cylindrical flange or rim 21 around its outer periphery and a cylindrical sleeve 22 around the central aperture 23. Ring 19 is mounted for vertical sliding movement on frame 17 by means of interengaged guides 24. A lever 25 fulcrumed on frame 17 as at 26 is connected at one end as by a chain 27 with ring 19 and is provided with a counterbalance weight 28 at its other end. This arrangement permits ring 19 to move freely up and down on frame 17.

The knives 30 are each supported on ring 19 for movement radially thereof by means of arms 31 pivotally supported around the outer surface of sleeve 22 between brackets 32. In order to allow for substantial pivotal movement of the knives and to provide lateral support for arms 31, slots 33 and 34 are milled in sleeve 22 and plate 20, respectively. Slots 33 and 34 form guideways for arms 31. As will be described more fully hereinafter, the knives 30 are arranged in several groups around ring 19, the knives in each group providing an oblique or echelon formation. Accordingly, brackets 32 are mounted around sleeve 22 in a longitudinally staggered arrangement and the slots 33 vary in length in accordance with the positioning of arms 31 so that all the knives are permitted to swing radially inwardly to form a circle corresponding in size to the smallest diameter log adapted to be debarked by the machine.

The free end of each arm 31 is bifurcated as at 35 for reception of a knife. A pin 36 extends across the bifurcation and pivotally supports the knife blade 30. The knife blade is formed with a round hole 37 from one side of which extends

a slot 38. The shank of pin 36 is provided with a pair of opposed flats 39 spaced apart to correspond with the width of slot 38 such that the knife may be mounted on the end of arm 31 by aligning slot 38 with flats 39, slipping the knife over the pin and thereafter rotating the knife on pin 36 to the operative position wherein slot 38 is disposed transversely of the flat faces 39.

Each of the knives 30 are individually biased to swing radially inwardly of ring 19 by a spring 40 supported on a guide rod 41. The inner end portion of each guide rod 41 is formed with diametrically opposed slots or keyways 42 which interengage with a slotted portion 43 of knife 30 to hold the knife in the operative position. The outer end of each rod 41 is loosely guided within an adjusting sleeve 44 which is externally threaded for engagement with an end cap 45, which end caps are retained within sockets 46 spaced circumferentially around rim 21. End caps 45 are fashioned with diametrically opposed ears 48 and sockets 46 are formed with corresponding openings 47 which enable inserting caps 45 inwardly through sockets 46 and then turning caps 45 through 90° to engage ears 48 within seats 49 counterbored on the inner surface of rim 21 (see Fig. 7). Each spring 40 acts between a washer 50 fixed on rod 41 as by a pin 51 and a washer 52 at the inner end of sleeve 44.

It will be observed that force exerted by spring 40 on the rods 41 and tending to urge the knives radially inwardly can be varied by threading sleeve 41 inwardly and outwardly of cap 45. Sockets 46 are of course staggered around rim 21 to correspond with the staggered positioning of the knives (see Fig. 10). Each knife and its support arm 31 is thereby permitted to swing radially of ring 19 independently of the other knives, each rod 41 assuming a more or less tilted position within its sleeve 44 depending upon the radial position of the knife.

The knives in each group include a lead knife 30*a* flanked on each side by stripping knives 30*b*, 30*c*, 30*d*, 30*e*, etc. All the knives may be shaped similarly to the knife illustrated in Fig. 11. However, in the preferred arrangement only the lead knife is shaped as is shown in Fig. 11, the stripping knives having the construction shown in Fig. 4. The knife shown in Fig. 11 includes a body portion 55 in which the round aperture 37 and the slotted portions 38 and 43 are formed and blade portions 56 and 57. Blades 56 and 57 are formed by beveling one of the flat faces of the body 55 preferably at an angle of about 45°. Blades 56 and 57 are angularly related, the angle therebetween preferably being about 90°. These blade portions are formed such that when the knife is in the operative position, that is, the position illustrated in Fig. 11, blade 57 is inclined to the longitudinal axis of the log being stripped at an angle of about 50–55° and blade 56 at an angle of about 35–40°. The primary function of the lead knife is simply to make a cut through the bark on the surface of the log and the above mentioned angle of 50–55° enables the knife to readily surmount the end of the log and ride over any obstructions on the bark surface such as rough wood, branch stubs, knots, etc. The blade portion 56 is preferably formed with a blunt edge to prevent the knife from cutting too deeply into the wood below the bark. When knives similar to that illustrated in Fig. 11 are used as the stripping knives as well as the lead knife, the wedge shaped cross section of blade portion 57 initiates the sidewise displacement of the bark strip being cut on the surface of the log.

The preferred form of stripping knife (Figs. 2 and 4) is provided with a blade portion 60 shaped and disposed similarly to the blade portion 57 of the knife illustrated in Fig. 11. However, in place of the trailing blade portion 56, the preferred stripping knife is provided with a laterally projecting wing 61 which is preferably inclined to the plane of the knife at an angle of less than 90° (see Fig. 6). Wing 61 extends downwardly to the lower end of the knife and is disposed on that side of the knife which corresponds with the beveled face of blade 60. The lower portion of wing 61 is of tapered cross section, being of less thickness at its lower end than at its upper end. This enables the knife to reenter or engage beneath a strip of bark after the knife rides over a knot or other obstruction on the bark surface. The lower end of wing 61 is rounded as at 62 to prevent the knife from cutting into the wood below the bark and thus causing wood loss.

The echelon formation of each group of knives is shown diagrammatically in Fig. 9 wherein, for the purposes of illustration, the knife pattern around a portion of ring 19 has been developed in the flat for a small size log. Four groups of knives are shown, the lead knife in each group being designated 30*a* and the adjacent lead knives being formed one with the beveled face of the blade on the right side and the next with the beveled face of the blade on the left side. The first lead knife 30*a* at the left in Fig. 9 is flanked on the left by a stripper knife 30*b* and on the right by stripper knives 30*c*, 30*d*, and 30*e*. The second lead knife from the left is spaced rearwardly of the first lead knife so that on small diameter logs, the knives can be spaced closely circumferentially at the bark surface and yet not interfere one with the other. The staggered arrangement of the lead knives also lessens the power required to drive the log into the circle of knives, since the knives strike the end of the logs in successive groups rather than all at the same time.

The second lead knife 30*a* is flanked on the left by stripping knives 30*f* and 30*g* and on the right by knife 30*h*. The third lead knife from the left is flanked on the left by stripping knives 30*i* and 30*j* and on the right by stripping knives 30*k* and 30*m*. The fourth lead knife shown is flanked on the left by stripping knives 30*n*, 30*p* and 30*q*, and on the right by stripping knives 30*r* and 30*s*.

The stripping knives are formed as lefts and rights so that all the knives in each group tend to displace the cut strips of bark circumferentially toward the slit made by the lead knife of the group. In the machine illustrated sixty knives are provided and the staggered relation of the knives in the various groups is such that at all times the forces exerted on the log by the right hand knives tending to rotate the log in one direction are balanced by the forces exerted on the log by the left hand knives and tending to rotate the log in the opposite direction.

In operation the log 14 to be stripped is driven through the circle of knives by any suitable means, such as ram 65. Or, if desired, the log may be fed through by suitable driving rolls 11. As the end of the log approaches head 12, ring 19 is positioned such that the knives are disposed generally concentric with the axis of the log. This is readily accomplished by reason of the shiftable mounting of frames 15 and 17. The log is then fed into the knife circle, that is, in a direction from right to left as viewed in Figs. 1 and 2.

As the log is pushed through the cutting head, the blade portion 57 of the lead knives rides over the end of the log and the arms 31 supporting the lead knives are thereby pivoted radially outwardly. As the log moves progressively through the head, the stripping knives successively engage and ride over the end of the log. It will be noted that pivotally supported arms 31 allow the circle of knives to readily expand to the diameter of the log being peeled. By means of this arrangement a single machine is adapted to peel logs which vary considerably in diameter. For example, the same machine can be used to peel logs from four to twelve inches in diameter.

The bark 66 is, of course, much softer than the wood portions 67 of the log and the lead knives thereby cut through the bark. Sleeves 44 are adjusted such that springs 40 maintain adequate pressure on the knives to cut through the bark of logs of different diameters. Logs of larger diameter have thicker bark and require a higher pressure on the knives to penetrate through the bark. This increased pressure is provided by the increase in the compression of springs 40 and may be further increased by threading sleeves 44 inwardly of caps 45. Each lead knife thereby penetrates through the bark and makes a single cut or score line therethrough the length of the log.

The stripping knives also cut through the bark down to the wood, and displace the bark in a circumferential direction. When the conditions are such that the bark is adapted to be separated from the wood rather easily, that is, during the peeling season and when the wood is not frozen, stripping knives of the type illustrated in Fig. 11 may be employed. The blade portion 57 penetrates through the bark, and the beveled face 68 displaces the strip of bark circumferentially of the log. It will be observed that each of the stripping knives displaces its strip of bark into a peeled portion of log, the strips on each side of each lead knife being displaced toward each other. It will be noted, however, that the first stripping knives on each side of each lead knife are staggered relative to each other so that the one strip of bark is cut and displaced in advance of the other.

During the "tight" season, or when it is desired to peel a relatively wide strip of bark from frozen wood, the form of stripping knife illustrated in Fig. 4 is employed in preference to that shown in Fig. 11. When stripping knives of the type shown in Fig. 4 are employed, the bark is cut into strips by the blade portion 60 and the wing portion 61 engages beneath the strip of bark and assists in separating it from the wood and displacing it sidewise. This is shown clearly in Fig. 14.

It will be noted that both forms of stripping knives are designed to peel a strip of bark much wider than the thickness of the knife blade. The relatively wide angle between the faces of the wedge shaped blade serves to initiate the sidewise displacement of the strip of bark being cut and at the same time minimizes the tendency of the knives to cut too deeply into the wood below the bark at the forward end of the log. It will also be noted that the pivotal mounting of the knives enables the individual knives to ride over obstructions on the surface of the log being stripped and that the freely floating mounting of the knife rings 19 enables the circle of knives to center on the log and thereby handle crooked as well as straight logs.

We claim:

1. A device for removing bark from a log comprising a first support on which a log is adapted to be moved axially, means for moving a log axially on said first support, a scond support adjacent said first support, a plurality of knives on said second support and arranged circumferentially of a log supported on said first support, said knives being supported for movement on said second support in a direction generally radially of a log on said first support, means resiliently biasing said knives in a direction radially inwardly to a position wherein the knives lie in the path of travel of a log on said first support, said knives, when in said last mentioned position, each having a leading side thereof inclined to the longitudinal axis of a log on said first support so as to engage the end of an oncoming log and thereby move the knife radially outwardly so that the knives cut into the bark as the log is moved past the knives, said knives being spaced apart so as to cut the bark of the log lengthwise into strips, each of said knives having its leading side formed as a cutting edge of wedge shape in cross section, the thickness of said wedge being such that, as the knife cuts through the bark, at least one face of said wedge exerts a sufficient sidewise pressure on the bark to overcome the adhesion between the bark and the wood, and to bodily displace the bark circumferentially and in the form of a strip, at least a portion of said knives each being provided on a trailing side thereof with a lateral extension shaped to engage beneath the displaced strip of bark and thereby to lift the bark from the surface of the log.

2. The combination set forth in claim 1 wherein said lateral extension terminates at its lower end adjacent the trailing end of said wedge-shaped cutting edge, said lateral extension being of tapered cross section with its lower end thinner than its upper end.

3. The combination set forth in claim 1 wherein said second support is floatingly mounted relative to said first support so that it is free to move in a plane substantially perpendicular to the axis of a log on said first support.

4. A device for removing bark from a log comprising a first support on which a log is adapted to be moved axially, means for moving a log axially on said first support, a second support adjacent said first support, a plurality of knives pivotally supported on said second support and arranged circumferentially of a log supported on said first support, said knives being supported for pivotal movement on said second support in a direction generally radially of a log on said first support, means resiliently biasing said knives in a direction radially inwardly to a position wherein the knives lie in the path of travel of a log on said support, said knives, when in said last mentioned position, each having a leading cutting edge thereof inclined to the longitudinal axis of a log on said support so as to be engaged by the end of an oncoming log to pivot the knife radially outwardly so that the knives cut into the bark as the log is moved past the knives, said knives being spaced apart circumferentially to cut the back of the log lengthwise into a plurality of strips and having means disposed rearwardly of said cutting edge forming a lateral obstruction for displacing the strips of bark sidewise and thereby overcome the adhesion between the back and the wood, said last mentioned means being associated with the knives such that some of the strips of bark are displaced

circumferentially of the log in one direction and others are displaced circumferentially of the log in the opposite direction.

5. The combination set forth in claim 4 wherein said knives are staggered in a direction axially of the log and arranged such that the number of knives tending to displace bark in the one direction is equal to the number of knives tending to displace bark in the opposite direction whereby the forces tending to rotate the log in opposite directions are generally balanced.

6. The combination set forth in claim 4 wherein said knives are arranged in right and left echelon formations.

7. In a device for removing bark from a log, a knife having a blade portion provided with converging sides, a cutting edge along one of said sides, said blade portion having along the other side a wing member projecting therefrom and extending generally transversely of the plane of said blade member, the angle included between the plane of the blade and the plane of the wing member being greater than 90°.

8. The combination set forth in claim 7 wherein said wing member extends along said other side of said blade substantially to its point of convergence with the side having said cutting edge.

9. The combination set forth in claim 8 wherein said wing member is of tapered cross section, being progressively thicker in a direction away from said cutting edge.

10. The combination set forth in claim 8 wherein a side of said wing member adjacent said point of convergence is rounded in cross section.

11. The method of removing bark from a log which comprises slitting a portion of the bark down to the wood along three generally parallel lines which extend continuously in a direction axially of the log to divide the bark into two continuous strips, applying a lateral pressure locally to one of said strips in a direction generally transversely of the direction of slitting and towards the center slit, applying a lateral pressure locally to the other strip in a direction generally opposite to the application of pressure to the first mentioned strip, the loci of application of said pressures being staggered one ahead of the other relative to the direction of slitting, and moving the loci of application of said two pressures simultaneously in the direction of said slits, said lateral pressures being sufficiently great to overcome the adhesion between the bark and the wood across the entire width of said strips whereby transversely aligned portions of said two strips of bark are successively displaced sidewise in opposite directions towards each other.

12. The method defined in claim 11 wherein the steps of slitting and laterally displacing said strips are performed simultaneously.

13. The method of removing bark from a log which comprises slitting the bark down to the wood simultaneously along a series of generally parallel lines which extend continuously in a direction longitudinally of the log to provide at least a portion of the bark into a plurality of longitudinally continuous strips which may be divided into two adjacent groups, applying sufficient sidewise pressure locally and simultaneously to each of said strips in a direction such as to bodily displace a full width portion of each strip in one group laterally in one direction and a portion of each strip of the other group laterally in the opposite direction, the loci of application of said pressures being staggered relative to each other, and moving the loci of application of said pressures continuously in the direction of said slits so that transversely aligned portions of the two adjacent strips of said two groups are successively displaced towards each other and so that transversely aligned portions of the remaining strips in each group are displaced successively towards said first mentioned strip in each group.

14. The method defined in claim 13 wherein the entire periphery of the log is simultaneously divided into adjacent groups of slits and wherein said lateral pressures are distributed so that the forces tending to rotate the log in one direction are balanced by the forces tending to rotate the log in the opposite direction.

15. A device for removing bark from a log comprising a first support on which a log is adapted to be moved axially, means for moving a log axially on said first support, a second support adjacent said first support, a plurality of arms mounted on said second support for pivotal movement in a direction toward and away from the axis of a log on said first support, and knife members at the free ends of said arms, said arms being divided into a plurality of successive groups extending around the periphery of a log positioned on said first support, the knives in each group being arranged in a right and a left echelon which extends obliquely to the axis of the log, the lead knife in each group being fashioned to form a slit through the bark and the additional knives being provided with cutting edges arranged to cut through the bark and also being provided with means forming a lateral obstruction disposed rearwardly of the cutting edge for displacing the cut strip of bark sidewise.

16. The combination set forth in claim 15 wherein the knives which are positioned on the right side of the lead knives are arranged to displace bark in a direction toward the left and the knives positioned on the left side of the lead knives are arranged to displace bark in a direction towards the right.

17. The combination set forth in claim 16 wherein said groups of knives are staggered axially of the log.

18. The combination set forth in claim 17 wherein the end knives of the adjacent groups are arranged to displace contiguous portions of the bark in opposite directions.

19. The combination set forth in claim 18 wherein the number of knives tending to displace bark in one direction is equal to the number of knives tending to displace bark in the opposite direction.

20. A device for removing bark from a log comprising a first support on which a log is adapted to be moved axially, means for moving a log axially on said first support, a second support floatingly carried by said first support and being freely movable vertically and horizontally on said first support in a plane perpendicular to the axis of a log on said first support, a plurality of independently movable arms arranged in arcuate fashion on said second support, said arms being mounted on said second support for pivotal movement toward and away from the axis of a log on said first support, means biasing said arms in a direction towards the axis of a log on said first support, and knife members at the free ends of said arms adapted to engage and cut through the bark of a log moved axially along said first support, said biasing means being of sufficient strength to cause movement of said second support on said first support when the

axis of a log moving past said knives shifts horizontally or vertically.

21. A device for removing bark from a log comprising a first support for a log, means for moving a log axially on said first support, a second support adjacent said first support, a plurality of arms arranged in a circular fashion on said second support and being mounted on said second support for pivotal movement in a direction generally radially of a log on said first support, knife members at the free ends of said arms, and support means on said second support spaced from the pivotal connection between said arms and said second support towards the free ends of said arms and defining a plurality of axially extending guide slots which are spaced circumferentially around a log on said first support, said arms being pivotally movable in said guide slots in a direction toward and away from the axis of a log positioned on said first support.

22. The combination set forth in claim 21 wherein at least some of the knives at the free ends of said arms cut through the bark of a log moving past said knives and apply a sidewise pressure to the cut strips of bark.

23. A device for removing bark from a log comprising a first support on which a log is adapted to be moved axially, means for moving a log axially on said first support, a second support floatingly carried by said first support and being freely movable vertically and horizontally on said first support in a plane perpendicular to the axis of a log on said first support, a plurality of independently movable arms arranged in arcuate fashion on said second support, said arms being mounted on said second support for movement toward and away from the axis of a log on said first support, means biasing said arms in a direction towards the axis of a log on said first support, and knife members at the free ends of said arms adapted to engage and cut through the bark of a log moved axially along said first support, said biasing means being of sufficient strength to cause movement of said second support on said first support when the axis of a log moving past said knives shifts horizontally or vertically.

24. A device for removing bark from a log comprising a first support on which a log is adapted to be moved axially, means for moving a log axially on said first support, a second support floatingly carried by said first support and being freely movable vertically and horizontally on said first support in a plane perpendicular to the axis of a log on said first support, a plurality of independently movable arms arranged in arcuate fashion on said second support, said arms being mounted on said second support for movement toward and away from the axis of a log on said first support, knife members at the free ends of said arms adapted to engage and cut through the bark of a log moved axially along said first support and means on said second support for maintaining said knives in engagement with the bark of a log on said first support with sufficient force to cause movement of the second support on the first support when the axis of a log moving past said knives shifts horizontally or vertically.

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Number	Name	Date
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707,428	Kidder	Aug. 19, 1902
739,495	Kidder	Sept. 22, 1903
1,233,321	De Cew	July 17, 1917
1,440,042	Whalley	Dec. 26, 1922
1,539,603	Saprones	May 26, 1925
1,673,265	Pangborn	June 12, 1928
1,703,305	Jenkins	Feb. 26, 1929
2,452,631	Cameron	Nov. 2, 1948
2,473,461	White	June 14, 1949
2,520,274	Cline	Aug. 29, 1950
2,575,422	Laulainen	Nov. 20, 1951
2,623,558	Andersen	Dec. 30, 1952

FOREIGN PATENTS

Number	Country	Date
375,241	Germany	May 9, 1923