

APPARATUS AND METHOD FOR REMOVING BARK FROM LOGS

Field of Invention

Embodiments invention relate to debarking apparatus for bark removal from
5 logs, where the logs, stacked on top of one another, are made to repeatedly rub
against one another and against abrading sections provided on the apparatus.
Abrasive frictional contact among logs, and between logs and abrading sections
results in dislodging or removal of bark from the logs.

10 Background

Debarked wood is essential to manufacture of pulp for paper production.

Currently, mechanized and semi-mechanized debarking systems are
employed in field debarking of tree logs, however, each system has its associated
disadvantages.

15 An example of a mechanized debarking system is a harvester/debarker
attachment, which is installed on an excavator in the 20-tonne weight class, for
shearing bark from logs. Mechanized debarking system can achieve high
productivity as it requires less manpower while delivering high output rate. However,
mechanized debarking system is expensive, has a short life-time and results in
20 breakage of irregular-shaped logs.

Semi-mechanized system can result in lesser breakage and higher quality
debarked logs. However, semi-mechanized system requires more manpower, poses
a hazard to human safety and results in a lower productivity.

Accordingly, it would be desirable to provide an apparatus for bark removal
25 from logs, which would address the above and other issues.

Summary

According to one aspect of the invention, an apparatus for removing bark from
30 logs is disclosed. The apparatus comprises:

- a base;

- a plurality of log-supporting sections mounted upon the base, each of
the plurality of log-supporting sections having a plurality of generally sloping

laterally opposed sides respectively joined to a plurality of seats, wherein the plurality of log-supporting sections are separated by a passage configured for access by a mechanized grapple;

5 a plurality of longitudinally opposed sides arranged in cooperation with the plurality of log-supporting sections to retain the logs within the plurality of log-supporting sections;

10 a plurality of abrading sections provided on each of the plurality of log-supporting sections configured to abrade bark from the logs, wherein each of the plurality of log-supporting sections is provided with a plurality of openings to allow abraded bark fragments pass therethrough; and

at least one bark catcher provided on any of the plurality of longitudinally opposed sides and configured to remove hanging bark from the logs.

15 In certain embodiments, the plurality of abrading sections are non-contiguous, and each of the plurality of abrading sections comprises at least one abrading element.

20 In certain embodiments, each of the plurality of abrading sections may include one of a saw-tooth profile, a threaded profile, a semi-circular profile.

In certain embodiments, the plurality of abrading sections are arranged at an angle diagonal to a lateral axis of each of the plurality of log-supporting sections.

25 In certain embodiments, each of the abrading sections comprises a plurality of abrading elements and each of the plurality of abrading sections having a rugged surface.

30 In certain embodiments, the abrading sections are removably installed in a plurality of slots provided at and along each of the plurality of log-supporting sections.

In certain embodiments, the bark catcher includes one of a notched projection member and a saw-tooth projection member.

5 In certain embodiments, the laterally opposed sides and the seat include a substantially downwardly tapered U-shape cross-section, wherein the laterally opposed sides and the seats include a plurality of tubular members which are interconnected by welding.

10 In certain embodiments, the laterally opposed sides are inclined at an angle of about 20° to a vertical plane, and wherein the longitudinally opposed sides are inclined at an angle of about 10° to a vertical plane.

In certain embodiments, the plurality of abrading sections are provided with non-uniform cross-section.
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In certain embodiments, a diameter of the plurality of abrading sections is at least 25% of a diameter of the logs to be debarked.

20 According to one aspect of the invention, a method of removing bark from logs is provided. The method comprises:

transferring a plurality of logs to a plurality of log-supporting sections being mounted upon a base, each of the plurality of log-supporting sections having a plurality of generally sloping laterally opposed sides respectively joined to a plurality of seats, wherein the plurality of log-supporting sections
25 are separated by a passage being devoid of the plurality of log-supporting sections, and wherein a plurality of longitudinally opposed sides are arranged in cooperation with the plurality of log-supporting sections to retain the logs within the plurality of log-supporting sections;

30 through the passage, gripping a subset of the logs located below a top of the pile;

alternately pushing and pulling the subset of the logs along an inner surface of the plurality of log-supporting sections, including abrading the logs

against one another and against a plurality of abrading sections provided on each the plurality of log-supporting sections; and

allowing abraded bark fragments pass through a plurality of openings provided at the plurality of log-supporting sections.

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In certain embodiments of the method, gripping a subset of the logs includes gripping the subset of the logs by a grapple.

10 In certain embodiments, the method further comprises: after alternately pushing and pulling the subset of the logs, removing hanging bark from the logs by passing the logs over at least one bark catcher provided on any of the plurality of longitudinally opposed sides.

15 In certain embodiments, the method further comprises: after alternately pushing and pulling the subset of the logs, transferring the logs out of the plurality of log-supporting sections.

In certain embodiments, the method further comprises: removing bark fragments by one of overturning, flipping, shaking and rocking the apparatus.

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According to one aspect of the invention, a system comprises:

an apparatus for removing bark from logs;

25 an excavator having a grapple configured to alternating pushing and pulling the logs against an inner surface of the plurality of log-supporting sections to abrade bark from the logs, and further configured to pass the logs over the at least one bark catcher provided on the plurality of longitudinally opposed sides to remove hanging bark from the logs.

30 In certain embodiments, the apparatus for removing bark from logs is connected to the excavator by a line and towed by the excavator over a ground surface.

Brief Description of Drawings

The invention will be described in detail with reference to the accompanying drawings, in which:

Figure 1 shows a perspective view of a debarking apparatus according to one embodiment of the invention;

Figure 2 shows a top view of the apparatus of Figure 1;

Figure 3 is a partial close-up view of the abrading sections in the apparatus of Figures 1 to 2;

Figure 4A(i) shows side view of one example of abrading sections;

Figure 4A(ii) shows a top view of Figure 4A(i);

Figure 4A(iii) shows a perspective view of Figure 4A(i);

Figure 4B(i) shows side view of another example of abrading sections;

Figure 4B(ii) shows a top view of Figure 4B(i);

Figure 4B(iii) shows a perspective view of Figure 4B(i);

Figure 4C(i) shows side view of yet another example of abrading sections;

Figure 4C(ii) shows a top view of Figure 4C(i);

Figure 4C(iii) shows a perspective view of Figure 4C(i);

Figures 5A and 5B show various examples of abrading sections which are removably installed in a plurality of slots;

Figure 6 is a schematic cross-sectional representation of logs being supported on abrading sections;

Figure 7A shows a debarking apparatus having one example of bark catcher;

Figure 7B is a close-up view of the bark catcher in Figure 7A;

Figure 7C shows a debarking apparatus having another example of bark catcher;

Figure 7D is a close-up view of the bark catcher in Figure 7C;

Figure 8 is a flow chart illustrating a debarking method according to one embodiment of the invention;

Figures 9A to 9J show debarking of logs using a mechanized grapple;

Figure 10 shows a grapple excavator towing a debarking apparatus;

Figures 11A and 11B show various means for attaching a tow line to a debarking apparatus;

Figure 12A and 12B show various debarking apparatus with wheels.

Detailed Description

In the following description, numerous specific details are set forth in order to provide a thorough understanding of various illustrative embodiments of the invention. It will be understood, however, to one skilled in the art, that embodiments of the invention may be practiced without some or all of these specific details. It is understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to limit the scope of the invention. In the drawings, like reference numerals refer to same or similar functionalities or features throughout the several views.

As used in the description and claims, unless otherwise specified the use of the terms "longitudinally", "laterally" merely indicate that different direction and/or spatial arrangement of like elements are being referred to, and are not intended to imply that the elements so described must be in a given dimensional proportion or angular relationship.

Reference is made to Figures 1 to 2 which show an apparatus 100 for removing bark from logs according to one embodiment of the invention.

The apparatus 100 includes a base 110 configured to provide stable support to the apparatus 100 and elevate a remaining or other parts or portions of the apparatus 100 above from the ground during deployment of the apparatus 100. The base 110 may be provided with a cavity or space which is arranged in cooperation with the remaining of the apparatus 100 to receive bark fragments produced during a debarking process. More intimately, the apparatus while in transportation having an undercarriage to receive bark fragments. The base 110 may be provided with wheels (see Figures 12A and 12B) mounted thereto for transporting the apparatus 100. The apparatus 100 with wheels adapted to traverse through undulating terrain. The wheels may further incorporate actuators to account for an uneven terrain while traversing in the field.

The apparatus 100 further includes at least a plurality of log-supporting sections 120 configured to contain logs during a debarking process and provide an abrading arrangement for removing bark from logs during a debarking process. The log-supporting sections 120 are mounted upon the base 110. Each log-supporting section includes a plurality of generally sloping laterally opposed sides 120a-120c which are respectively joined or welded to form seats 124a-124c. This arrangement provides an open top to each log-supporting section for transferring logs into and out of the apparatus 100. In the apparatus 100 of Figures 1 to 2, the laterally opposed sides 120a-120c and the seats 124a-124c include a substantially downwardly tapered U-shape cross-section. The laterally opposed sides 120a-120c may be inclined at an angle of about 20° to a vertical plane.

The log-supporting sections 120 are separated or interposed by a passage 130 being devoid or not part of the log-supporting sections 120. Providing this passage 130 enables a mechanized grapple to access to logs contained in the log-supporting sections 120 without damaging the log-supporting sections 120 and apparatus 100.

Each log-supporting section 120 is provided with a plurality of openings 128 suitably dimensioned to allow abraded bark fragments, which are removed from logs, pass through the plurality of openings 128 to be collected in the cavity of the base 110 and/or outside the apparatus 100, e.g. on the ground. The plurality of openings 128 allow smaller abraded bark fragments to be discarded during debarking process, and therefore reduce buildup of abraded bark fragments in the plurality of log-supporting sections 120. Buildup of abraded bark fragments is undesirable as it impedes frictional contact among logs, thus reduces the grinding or rubbing effect, and also between logs and the plurality of log-supporting sections 120, and therefore reduces efficiency of the debarking process.

The abrading arrangement of the plurality of log-supporting sections 120 includes a plurality of abrading sections 125 configured to, after repeated frictional contact, remove or dislodge bark from the logs.

Figure 3 shows a partial close-up view of the plurality of abrading sections 125 of the apparatus 100 of Figures 1 to 2. Each of the plurality of abrading sections 125 comprises at least one abrading element 126. The plurality of abrading sections 125 may be arranged at an angle diagonal to a lateral axis of each log-supporting section 120, and further disposed in a spaced apart or non-contiguous arrangement. By arranging each of the plurality of abrading sections 125 diagonally, contact surface with logs is increased as the diagonal arrangement acts like a “hook” to catch the jutting and non-uniform surface of logs. The spaced apart or non-contiguous arrangement of the abrading sections 125 improves abrading even with non-uniform dimension in each part of the log surface.

Other arrangements of abrading sections are equally possible. Figures 4A(i), 4A(ii) and 4A(iii) show one example of each of the plurality of abrading sections or elements 125 having each of the at least one abrading element 126 positioned in a contiguous arrangement, wherein each abrading element has a semi-circular profile and a rugged or grainy surface. Figures 4B(i), 4B(ii) and 4B(iii) show another example of abrading sections in a non-contiguous or spaced apart arrangement, wherein each of the plurality of abrading elements 125 has a saw-tooth profile and an even surface. A person skilled in the general art will readily understand that the saw-tooth profile may include rugged or grainy surface to further enhance the abrading effect. Figures 4C(i), 4C(ii) and 4CA(iii) show another example of abrading sections in a non-contiguous or spaced apart arrangement, wherein each abrading section has a threaded profile. More intimately, each of the plurality of abrading section 125 is a portion of a rebar.

Figures 5A and 5B show various examples of abrading sections which are removably installed in a plurality of slots provided at and along each of the plurality of log-supporting sections 120. Each of the plurality of abrading sections 125 are seated in each of the plurality of slots and secured thereto by suitable fasteners such as nut and bolt. Worn out abrading sections can therefore be replaced by removing the worn out abrading sections and installing new abrading sections in the slots.

Figure 6 shows one example wherein a diameter (d_1) of abrading elements 126 is about 5 cm for debarking logs with diameter (d_2) up to about 20 cm, i.e. d_1 is at least 25% of d_2 . The width of the abrading elements 126 may be about 7.5 cm to about 10 cm, but are not limited to these dimensions.

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In certain other embodiments, the abrading sections or elements may take other shapes, arrangements, surface texture and/or size proportion relative to the logs to be debarked.

10 Referring to Figures 1 and 2, the apparatus 100 further includes a plurality of longitudinally opposed sides 140 arranged in cooperation with the plurality of log-supporting sections 120 to retain the logs within the plurality of log-supporting sections 120. In the apparatus 100 of Figures 1 to 3, the longitudinally opposed sides 140 include at least one wall 142, plate or surface which is substantially devoid
15 of openings or has openings which are suitably dimensioned to prevent log ends from passing or falling through the longitudinal ends of the apparatus 100. The longitudinally opposed sides 140 may be inclined at an angle of about 10° to a vertical plane.

20 At least one bark catcher 127 may be provided at each longitudinally opposed side 140, particularly at the upper most portion thereof. The at least one bark catcher 127 is configured to intercept hanging bark 210 when almost-debarked logs are being passed slightly over the bark catcher 127 and sever or separate or remove the hanging bark 210 from the logs as the logs are further passed over the bark
25 catcher 127. The bark catcher 127 may be provided as notched projection members 127 (see Figures 7A and 7B) or saw-tooth projection members 127 (see Figures 7C and 7D).

Referring to Figures 1 and 2, the apparatus 100 may further include at least
30 one pad-eye 150 or lug which is joined or welded to a suitable part of the apparatus 100, e.g. base, laterally opposed sides 120a-120c, longitudinally opposed sides 140. The pad-eye 150 allows transportation of the apparatus 100 by a winch, a lifting crane or an excavator with grapple attachment. Figure 10 shows an excavator 910

towing or transporting the apparatus 100 over a ground surface. The excavator 910 is connected to the apparatus 100 by a line or chain through the pad-eye 150 of the apparatus 100. Alternative to pad-eye, slots may be provided at a suitable part of the apparatus 100 for securing a tow line or winch. Referring to Figure 11A, the slots may be suitably positioned at the front and end portion of the apparatus.

The apparatus 100 of Figures 1 to 3 is constructed from rigid tubular members, e.g. steel pipes, which are interconnected to one another by welding. In certain other embodiments, the apparatus 100 may be constructed from rigid members having other profiles or shapes, or plates, or blocks, or any combinations thereof.

For illustrative purpose, the apparatus 100 of Figures 1 to 3 may have the following dimensions taken at the largest part: 5.5 m (length), 2.9 m (width), 2.2 m (height). The passage 130 separating the plurality of log-supporting sections 120 may be 1.5 m along the length of the apparatus 100.

Reference is made to Figures 8 and 9A to 9J. Figure 8 shows a flowchart 800 describing a method of removing bark from logs according to one embodiment of the invention. Figures 9A to 9J show debarking of logs using a mechanized grapple 920 in conjunction with bark removal apparatus 100 described in the foregoing paragraphs.

In block 802, an excavator 910 with mechanized grapple 920, logs to be debarked e.g. cut logs or stack of logs 10, and the bark removal apparatus 100 are arranged. Figures 9A and 9B shows an arrangement wherein a stack of logs 10 to be debarked placed on one side and the bark removal apparatus 100 are arranged within access of the mechanized grapple. Locations for stacking the cut logs to be debarked and debarked logs 12 interpose the excavator 910.

In block 804, a subset of cut logs 14 to be debarked are gripped from the stack of logs 10 and transferred to the plurality of log-supporting sections 120 of the bark removal apparatus by a mechanized grapple 920 (see Figures 9C and 9D). The transferred subset of cut logs 14 is provided as a pile.

In block 806, the subset of the logs 14 is gripped (see Figure 9E). If the gripped subset is located below a top of the pile or at a bottom of the pile, this will assist in interchanging and distributing logs in block 806.

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In block 808, the subset of the logs 14 being gripped is alternately pushed and pulled along inner surfaces of the plurality of log-supporting sections 120 (see Figures 9E and 9F). The pushing and pulling action resembles that of a rolling or rock-a-bye movement confined within an abrading space of a substantially downwardly tapered U shape configuration of the apparatus 100. Repeated push-pull actions result in abrasive frictional contact among logs, which removes bark from the logs. Repeated push-pull actions also result in abrasive frictional contact between the logs and each of the plurality of abrading sections or elements 125 on the plurality of log-supporting sections 120, which also removes barks from the log. Gripping a subset of logs located below the top or at the bottom of the pile followed by a push-pull action allows the remaining ungripped logs to interchange position with the subset of logs so that logs within the pile can be redistributed along the plurality of log-supporting sections 120 for more even processing. The abraded bark fragments are allowed to pass through the plurality of openings 128 provided at the plurality of log-supporting sections 120 to prevent buildup of bark fragments in the plurality of log-supporting sections 120.

In block 810, the logs are removed of any hanging bark 210 by passing the logs and hanging bark 210 slightly above or over the longitudinally opposed sides of the bark removal apparatus 100. The hanging bark 210 is caught by the at least one bark catcher 127 arranged on the longitudinally opposed sides and severed from the logs as the logs are further passed over the longitudinally opposed sides. After the hanging bark 210 is removed, the logs are substantially debarked. Figure 9G shows logs being passed over a debarking apparatus of Figure 7A. Figures 9H and 9I show logs being passed over a debarking apparatus of Figure 7C. One skilled in the art will readily understand that the removed barks are in an untidy order making removal of the hanging bark 210 slightly challenging. The excavator driver may use the grapple to retain the subset of the logs 14 and slide the removed barks to one side or

end of the logs. In this way, the bulk of the hanging bark 210 will hang on one side of the logs and easily caught by the at least one bark catcher 127 when passed over the longitudinally opposed sides 140.

5 In block 812, debarked logs 12 are transferred out of the plurality of log-supporting sections 120 (see Figure 9J). Optionally, the debarked logs 12 having excess barks or twigs may be manually cleaned to remove leftover bark, twigs, etc.

10 In block 814, bark fragments remaining in the remaining debarking apparatus are discarded. After several cycles of debarking of the stack of logs 10, leftover barks or bark fragments may remain on the plurality of log-supporting sections 120. As such, to this purpose, the mechanized grapple grips on any suitable locations of the apparatus 100, lifts and thereafter flips, shakes, rocks, tilts or overturns the debarking apparatus so that bark fragments are emptied therefrom. This is in
15 preparation of subsequent debarking as build up of bark fragments in the debarking apparatus would impede debarking efficiency. This flipping, shaking, rocking, tilting or overturning of the debarking apparatus by the mechanized grapple to discard bark fragments need only be carried out as and when sufficient bark fragments accumulate within the debarking apparatus.

20 Reference is made to Figures 9A and 9B wherein a system for bark removal from logs is provided. The system comprises: an apparatus 100 for removing bark from logs 10 according to the foregoing paragraphs; and an excavator 910 having a grapple 920 configured to remove bark from the logs 10 by alternating pushing and
25 pulling the logs 10 against an inner surface of the plurality of log-supporting sections 120, including abrading the logs 10 against one another and against each of the plurality of abrading sections or elements 125.

30 Reference is made to Figure 10 wherein the apparatus 100 is connected to the excavator 910, by a line or chain via the pad-eye 150, and towed by the excavator 910 over a ground surface. The apparatus 100 may be further connected to other units of the apparatus to form a series arrangement to be towed by the excavator 910. Figure 11A shows a slot provided in the apparatus 100 for attaching

a tow line. Figure 11B shows restrainers for preventing lateral movements in a tow line.

The invention is suitable for debarking wood including, but not limited to, A. mangium, A. crassicarpa, and Eucalyptus sp. The logs to be debarked may have length of about 4 m, about 2.5 m, or any length therebetween. About 85% bark can be removed from the log using the apparatus of the invention with less breakage.

Embodiments of the invention are particularly advantageous over existing processes and apparatuses as will be understood from the following.

(a) In existing debarking process, unwanted bark, twigs, branches and leaves that remain on debarked logs would be delivered to mill and would affect the output level of wood conversion to pulp. With the invention, logs are removed of these unwanted materials after debarking. The manual cleaning function happens occasionally.

(b) Damage to the log surface (fiber damage) is much less since there is no mechanical abrasion to the wood as the debarking procedure produces friction between logs. Chip quality will be better than mechanized process.

(c) Existing semi-mechanized debarking process is labour intensive requiring a crew of 15 people, and poses a hazard to human safety as the process is performed manually with open area contact. With the invention, the debarking process is less labour intensive and less hazardous as the process requires an excavator with fixed grapple and 2 to 3 people for manual cleaning to release remaining bark from debarked logs.

(d) Existing debarking process can achieve an output of 79 T/unit, from baseline calculation of working 7 hours/day; productivity 14 m³/day; conversion 0.81.

(e) Financial investment required by the invention is much lower compared to existing mechanised debarking. In some embodiments, the present invention

may be about 50% cheaper than existing mechanised debarking systems. For example, the cost of an existing mechanized debarking (debarking head) is typically about 1.5 billion Indonesian Rupiah while the cost of the pontoon of the present invention is about 51 million Indonesian Rupiah.

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(f) Existing harvester/debarker apparatus has a life time of about 3 years and requires an excavator in the 20-tonne weight class. The apparatus of the invention is low cost and easy to repair, and requires an excavator in the 10 to 15-tonne weight class. Use of a lower-tonnage equipment also translates into fuel savings of about 40% to 80%.

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(g) Manual debarking can achieve a productivity of about 4 m³/man/hour. Existing mechanized harvester can achieve a productivity of about 7.4 to 12.34 m³/hour. With the invention, average productivity of about 9.2 to 12 m³/hour can be achieved.

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(h) The invention is capable of debarking both young and dried-up wood. Young wood contains moist or water content within the grains that will prevent the logs from being brittle, whereas dried-up wood has a tendency having cracks within the grains. When the grains crack, the log becomes non-concentric in shape making it difficult to process and convert the log into wood chips.

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(i) The invention improves ease of transporting large volume of debarked logs through undulating terrains as multiple units of the bark removal apparatus (pontoons) can be connected to each other and towed out to the roads.

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(j) Unlike existing mechanized debarking process, the invention requires one mechanized equipment instead of two mechanized equipment to transfer logs into the bark removal apparatus and to debark the logs therein.

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It is to be understood that the embodiments and features described above should be considered exemplary and not restrictive. Many other embodiments will be

apparent to those skilled in the art from consideration of the specification and practice of the invention. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. Furthermore, certain terminology has been used for
5 the purposes of descriptive clarity, and not to limit the disclosed embodiments of the invention.

Claims

1. An apparatus for removing bark from logs, the apparatus comprising:

5 a base;

a plurality of log-supporting sections mounted upon the base, each of the plurality of log-supporting sections having a plurality of generally sloping laterally opposed sides respectively joined to a plurality of seats, wherein the plurality of log-supporting sections are separated by a passage configured for access by a mechanized grapple;

10 a plurality of longitudinally opposed sides arranged in cooperation with the plurality of log-supporting sections to retain the logs within the plurality of log-supporting sections;

15 a plurality of abrading sections provided on each of the plurality of log-supporting sections configured to abrade bark from the logs, wherein each of the plurality of log-supporting sections is provided with a plurality of openings to allow abraded bark fragments pass therethrough; and

at least one bark catcher provided on any of the plurality of longitudinally opposed sides and configured to remove hanging bark from the logs.

20 2. The apparatus of claim 1, wherein the plurality of abrading sections are non-contiguous, and each of the plurality of abrading sections comprises at least one abrading element.

25 3. The apparatus of claim 2, wherein each of the plurality of abrading sections includes one of a saw-tooth profile, a threaded profile, a semi-circular profile.

30 4. The apparatus of claim 1, wherein the plurality of abrading sections are arranged at an angle diagonal to a lateral axis of each of the plurality of log-supporting sections.

5. The apparatus of claim 1, wherein each of the abrading sections comprises a plurality of abrading elements and each of the plurality of abrading sections having a rugged surface.
- 5 6. The apparatus of claim 1, wherein the abrading sections are removably installed in a plurality of slots provided at and along each of the plurality of log-supporting sections.
7. The apparatus of claim 1, wherein the bark catcher includes one of a notched
10 projection member and a saw-tooth projection member.
8. The apparatus according to claim 1, wherein the laterally opposed sides and the seat includes a substantially downwardly tapered U-shape cross-section, wherein the laterally opposed sides and the seats include a plurality of tubular
15 members which are interconnected by welding.
9. The apparatus according to claim 1, wherein the laterally opposed sides are inclined at an angle of about 20° to a vertical plane, and wherein the longitudinally opposed sides are inclined at an angle of about 10° to a vertical plane.
- 20 10. The apparatus according to claim 1, wherein the plurality of abrading sections are provided with non-uniform cross-section.
11. The apparatus according to claim 1, wherein a diameter of the plurality of
25 abrading sections is at least 25% of a diameter of the logs to be debarked.
12. A method of removing bark from logs, the method comprising:
transferring a plurality of logs to a plurality of log-supporting sections being mounted upon a base, each of the plurality of log-supporting sections having a
30 plurality of generally sloping laterally opposed sides respectively joined to a plurality of seats, wherein the plurality of log-supporting sections are separated by a passage being devoid of the plurality of log-supporting sections, and wherein a plurality of

longitudinally opposed sides are arranged in cooperation with the plurality of log-supporting sections to retain the logs within the plurality of log-supporting sections;

through the passage, gripping a subset of the logs located below a top of the pile;

5 alternately pushing and pulling the subset of the logs along an inner surface of the plurality of log-supporting sections, including abrading the logs against one another and against a plurality of abrading sections provided on each the plurality of log-supporting sections; and

10 allowing abraded bark fragments pass through a plurality of openings provided at the plurality of log-supporting sections.

13. The method according to claim 12, wherein gripping a subset of the logs includes gripping the subset of the logs by a grapple.

15 14. The method according to claim 12, further comprising:

after alternately pushing and pulling the subset of the logs, removing hanging bark from the logs by passing the logs over at least one bark catcher provided on any of the plurality of longitudinally opposed sides.

20 15. The method according to claim 14, further comprising:

after alternately pushing and pulling the subset of the logs, transferring the logs out of the plurality of log-supporting sections.

16. The method according to any one of claim 12 to 15, further comprising:

25 removing bark fragments by one of overturning, flipping, shaking and rocking the apparatus.

17. A system comprising:

an apparatus for removing bark from logs according to any of claims 1 to 11;

30 an excavator having a grapple configured to alternating pushing and pulling the logs against an inner surface of the plurality of log-supporting sections to abrade bark from the logs, and further configured to pass the logs over the at least one bark

catcher provided on the plurality of longitudinally opposed sides to remove hanging bark from the logs.

18. The system of claim 17, wherein the apparatus is connected to the excavator
5 by a line and towed by the excavator over a ground surface.