

[54] LOG BARKER

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[58] Field of Search: 144/208 E, 208, 208 AU

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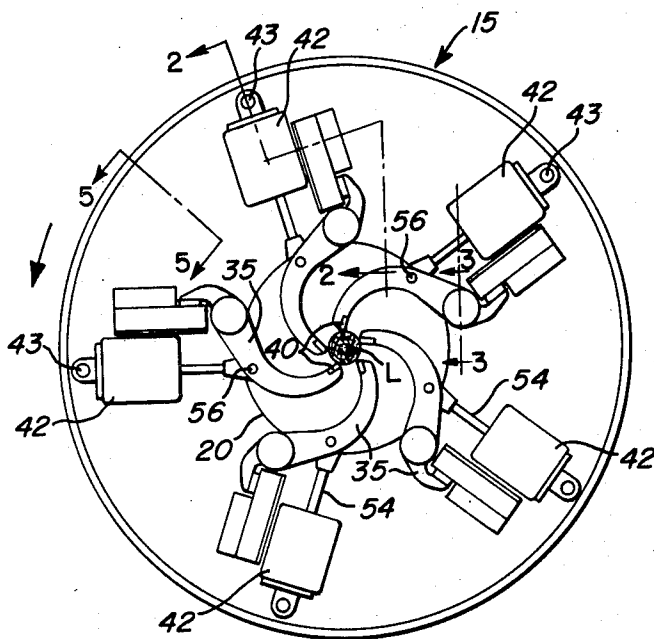
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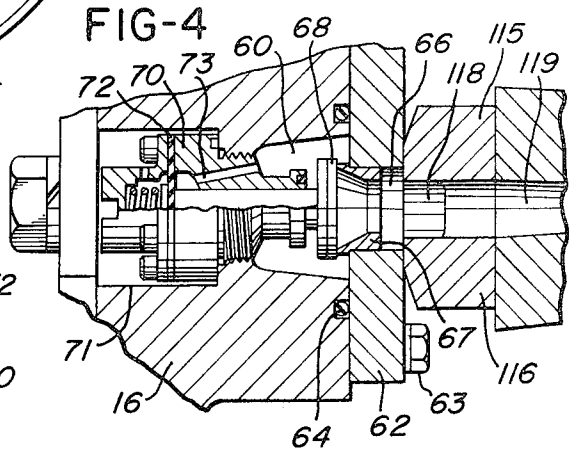
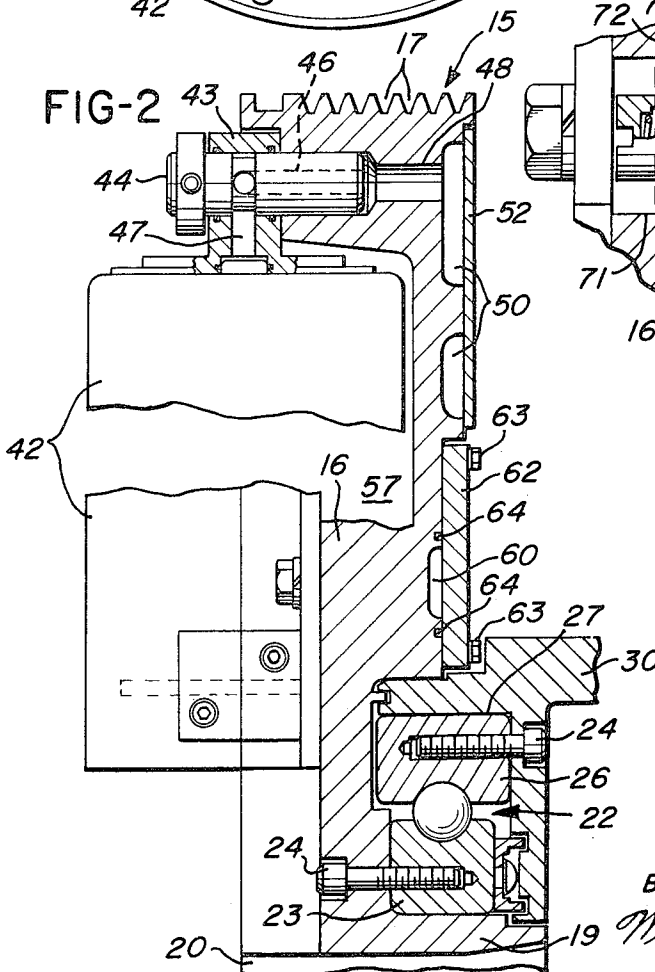
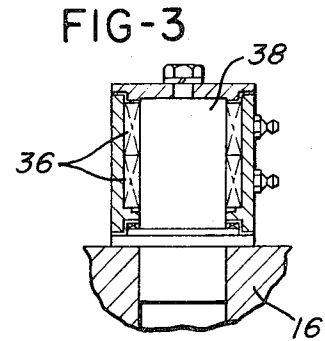
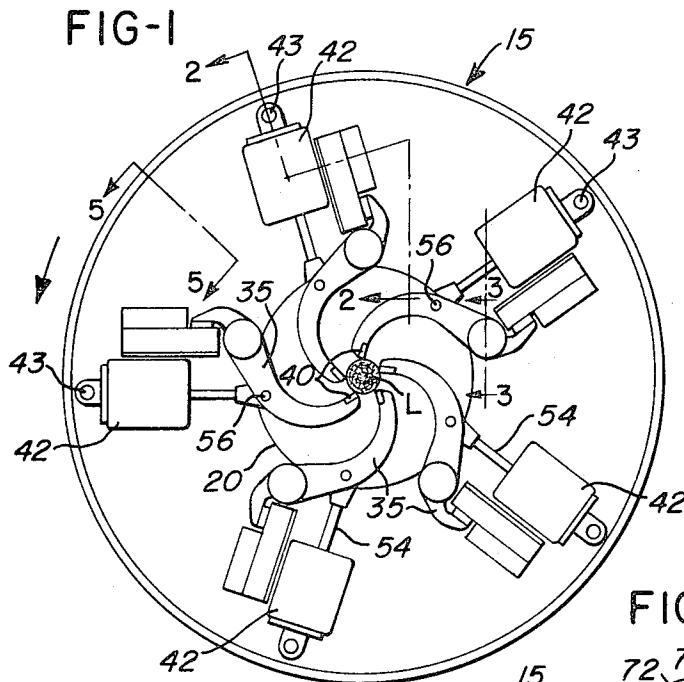
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[57] ABSTRACT

An annular barking rotor has a hub portion rotatably supported by a concentric anti-friction bearing and supports a plurality of radially pivotable barking arms each biased by an air motor mounted on the rotor and connected to an annular air chamber within the rotor. Air is supplied to the chamber and motors through a set of sliding air shoes, and the pressure of the air is controlled by a series of pilot operated valves, relay exhaust valves and regulating valves actuated by controls located at a remote console. Pilot operated diaphragm exhaust valves are carried by the rotor for connecting the air chamber directly to atmosphere and are actuated by a pulse of pilot air supplied through another air shoe connected to the main air supply through a pilot operated valve controlled by a valve also located at the console.

13 Claims, 7 Drawing Figures

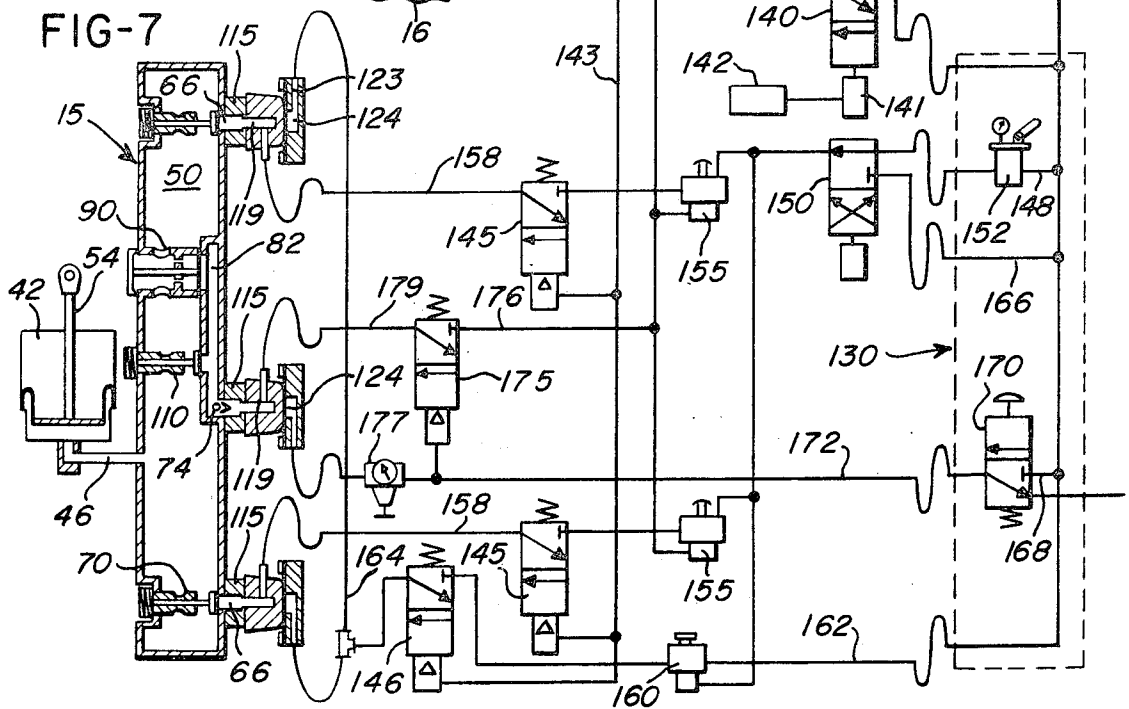
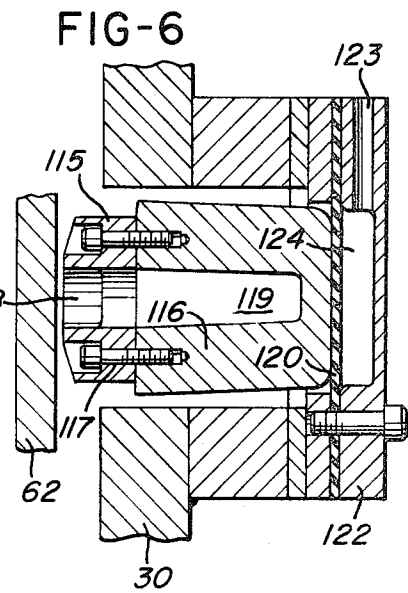
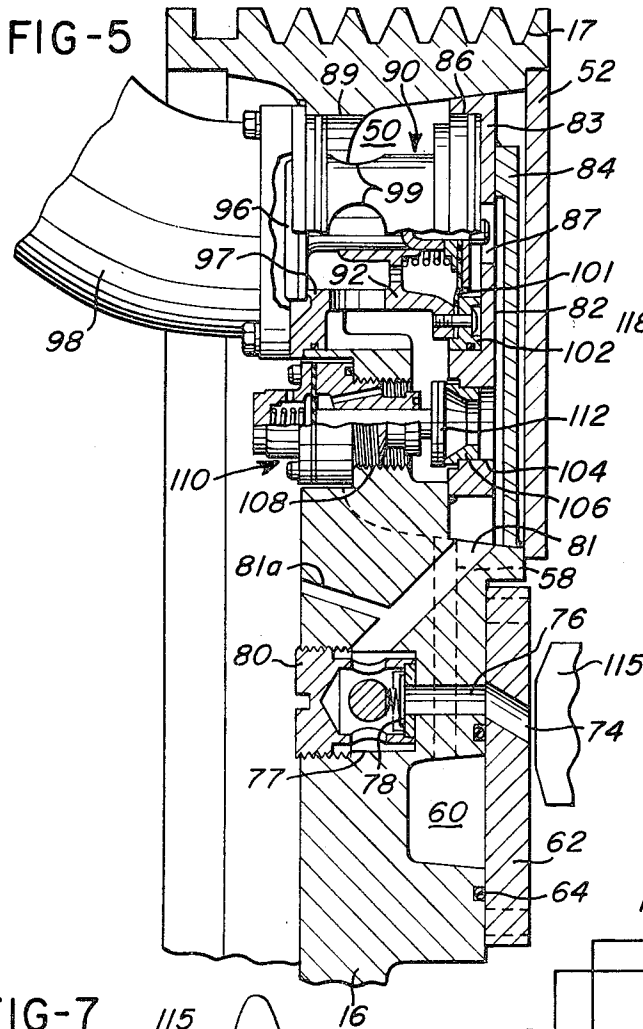




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LOG BARKER

BACKGROUND OF THE INVENTION

In a log barker as disclosed in U.S. Pat. No. 3,361,168 which issued to the assignee of the present invention, it is desirable to provide for controlling from a remote console an increase or a decrease in the pressure exerted by the barking arms on the surface of a log being fed through the annular rotor. It is also desirable for the barker to incorporate means for quickly releasing the pressure exerted by the barking arms in the event the barking arms jam or receive a larger diameter succeeding log. In the above patent, the pressure exerted by the barking arms is released by stopping the continuous air flow to the rotor through the sliding air shoes so that the air control system within the rotor exhausts and the pressure exerted by the barking arms releases.

Since a dwell or short time period is required to bleed the air control system within the rotor for actuating the exhaust valves, the release of the barking arms is not immediately responsive to the actuation of the remote control. Furthermore, the air control system within the rotor for operating the barking arms, requires a continuous supply of air. This requires that the air shoes must be in sliding pressure contact continuously during the debarking of a log and until it is desired to release the pressure exerted on the log by the barking arms.

SUMMARY OF THE INVENTION

The present invention is directed to a log barker which incorporates an improved rotor structure and control system which provides for immediately releasing from a remote control console the pressure exerted on a log by the barking arms and for quickly regulating the pressure exerted by the arms during a debarking operation. In accordance with a preferred embodiment of the invention, the rotor is supported by a large diameter anti-friction bearing which is concentric with the rotor and has an inner race mounted on a cylindrical hub portion of the rotor and an outer race secured to the main support frame.

The rotor carries a plurality of pivotal barking arms each operated by an air spring connected to an annular air reservoir chamber within the rotor. Air is supplied to the rotor chamber through a set of air shoes slidably engaging a radial face on the rotor and connected to a main air supply through pilot operated control valves, relay exhaust valves and a manually adjustable regulating valve. The rotor air chamber may be opened directly to atmosphere through a pair of large diaphragm actuated exhaust valves which are pilot operated in response to an air pulse supplied to the rotor through a sliding air shoe connected to a quick exhaust control valve located at the remote console.

More specific features and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a somewhat schematic elevational view of a log barker rotor constructed in accordance with the invention;

FIG. 2 is a fragmentary section taken generally on the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary section taken on the line 3—3 of FIG. 1;

FIG. 4 is a fragmentary section through the structure by which air is supplied to and removed from the rotor;

FIG. 5 is a section similar to FIG. 2 and taken generally on the line 5—5 of FIG. 1;

FIG. 6 is a fragmentary section similar to FIG. 4 and showing an air transfer shoe for supplying air to the rotor; and

FIG. 7 is a schematic diagram showing the pneumatic control system for operating the rotor barking arms shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a rotor assembly 15 including a cast metal annular housing 16 having circumferentially extending outer grooves 17 for receiving a multiple V-belt which is driven by a variable speed motor (not shown). The housing 16 includes an inner cylindrical hub portion 19 (FIG. 2) which defines a cylindrical opening or passage 20 through which a log L is fed in a conventional manner. A large diameter anti-friction bearing 22 is positioned concentric with the annular housing 16 and has an inner race 23 which is mounted on the cylindrical hub portion 19 of the housing 16 and is secured by a set of circumferentially spaced screws 24. The outer race 26 of the bearing 22 is retained within a counterbore 27 of the main support frame 30 by another set of screws 24.

A set of five arcuately shaped barking or abrading arms 35 are each pivotally supported by a pair of anti-friction bearings 36 (FIG. 3) mounted on a corresponding stub shaft 38 which projects axially from the housing 16. An abrading tool 40 is mounted on the inner tip of each arm 35 and is adapted to scrape bark from the log L when the rotor 15 is rotated in a clockwise direction as indicated in FIG. 1, this general arrangement and operation being essentially as described in U.S. Pat. No. 3,361,168.

The operating pressure of each of the abrading arms 35 is determined by a corresponding air motor 42 which preferably consists of an air spring or a rolling diaphragm air cylinder as shown in the above patent. Each of the air motors 42 includes a trunnion 43 which is pivotally mounted on a pin shaft 44 (FIGS. 1 and 2) projecting axially into a bore formed within the rotor housing 16. Each of the pin shafts 44 has an L-shaped inner passage 46 which connects a port 47 within the corresponding air motor support trunnion 43 with a passage 48 extending axially from an annular air reservoir or chamber 50 formed within the rotor housing 16 and covered by a flat annular plate 52 secured to the housing. The inner end of each air motor 42 is connected by a rod 54 (FIG. 1) to a pivot pin 56 which extends through the corresponding barking arm 35. From the above, it is apparent that the air pressure in the air chamber 50 and in the air motors 42 increases from a minimum to a maximum as the barking arms 35 move between corresponding inner positions (FIG. 1) for accommodating the minimum diameter log L and outwardly retracted positions (not illustrated) for accommodating the maximum diameter log.

By comparing FIGS. 2 and 5, it is apparent that the annular air chamber 50 within the rotor housing 16 changes in axial depth at angularly spaced intervals around the housing. That is, the rotor housing 16 is provided with a recess 57 (FIG. 2) for each of the air motors 42, and the air chamber 50 has its minimum axial depth in the area of each recess. Between the recesses 57, the air chamber 50 has its maximum axial depth, and in each of these areas, the chamber 50 is connected by a radially extending passage 58 (FIG. 5) to another annular air chamber 60 which is concentric with the chamber 50. As shown in FIGS. 2 and 5, the annular air chamber 60 also changes in axial depth at angular intervals around the rotor housing 16 to prevent interrupting the recesses 57 which receive the air motors 42. The air chamber 60 is covered by an annular flat air transfer plate 62 which is secured to the motor housing 16 by a set of angularly spaced screws 63 and is sealed to the rotor housing by a set of concentric O-rings 64.

Referring to FIG. 4, the air transfer plate 62 has a series of ten ports or holes 66 which are spaced uniformly around the plate. A tubular valve seat 67 is inserted into each of the holes 66 and is normally engaged by a spring biased plunger 68 of a corresponding poppet valve 70 which is recessed within an axially extending counterbore 71 formed within the rotor housing 16 opposite the annular air chamber 60. Each of the poppet valves 70 includes a diaphragm 72 which is open on the left side (FIG. 4) to atmosphere and open on the right side to the pressure within the chamber 60 through a port 73. The air

transfer plate 62 also has a series of two ports or holes 74 (FIG. 5) which are located approximately diametrically opposite on the plate 62 and are positioned radially outwardly of the holes 66. Each of the holes 74 connects with a corresponding passage 76 formed within the rotor housing 16 and extending axially from the inner end of a counterbore 77. Each passage 76 is normally closed by a spring biased washer 78 of a check valve 80 which is threaded into the counterbore 77.

Each of the two counterbores 77 and the corresponding check valve 80 is open to atmosphere through an outwardly extending passage 81 (FIG. 5) and a port 81a. The outer end of each passage 81 connects with a corresponding radially extending air chamber 82 defined within the chamber 50 between an inner plate 83 and an outer plate 84 which are welded to the rotor housing 16. A counterbore 86 is formed within each of the inner plates 83 concentric with a port 87 which opens into the outer end of the corresponding radially extending chamber 82. A cylindrical bore 89 is formed within the housing 16 in axial alignment with each of the counterbores 86, and a quick exhaust valve 90 is positioned within each set of aligned bores 86 and 89.

Each of the exhaust valves 90 includes a body 92 (FIG. 5) which supports a valve member 94 for sliding axial movement. Each of the valve members 94 has a head 96 which normally seats on a circular lip 97 formed on the outer end of the housing 92. A curved exhaust duct 98 is secured to the outer end of each of the valve housings 92, and a plurality of circumferentially spaced ports 99 are formed within the valve housing 92 to provide for exhausting the air reservoir chamber 50 through the ducts 98 when the valve members 94 are open. The inner end of each valve member 94 is connected to a flexible diaphragm 101 having its periphery secured to the housing 92 by a clamping ring 102 which seats within the corresponding counterbore 86.

A port 104 (FIG. 5) is formed within each of the inner plates 83 and receives a corresponding tubular valve seat 106 through which the corresponding air chamber 82 can communicate with the air reservoir chamber 50. A threaded bore 108 is formed within the rotor housing 16 in alignment with each of the ports 104, and a spring loaded diaphragm operated poppet valve 110 is threaded into each of the bores 108 in a manner similar to the poppet valves 70 shown in FIG. 4. Each of the poppet valves 110 includes a disk-like closure 112 which is normally urged against the corresponding valve seat 106 to seal each of the air chambers 82 from the main annular reservoir chamber 50.

Referring to FIGS. 4 and 6, a pair of arcuate air transfer shoes 115 are positioned adjacent the air transfer plate 62 in alignment with the annular array of holes 66 and poppet valves 70, and each shoe 115 is secured to a corresponding arcuate support housing 116 by a set of screws 117. Each air shoe 115 defines an arcuate cavity 118 which connects with a centrally located passage 119 formed within the housing 116. Each of the air transfer shoes 115 and its corresponding housing 116 is supported by a resilient diaphragm 120 which is secured to the main frame 30 by an arcuately shaped plate 122. An air passage 123 is formed within each of the plates 122 and opens into a chamber 124 behind the corresponding diaphragm 120. When the diaphragm is pressurized with air supplied through the passage 123, the corresponding air transfer shoe 115 moves from its retracted position (FIG. 6) to an extended position slidably engaging the annular air transfer plate 62. As shown in FIG. 5, another air transfer shoe 115 is positioned in alignment with the path of the holes 74 within the plate 62.

The pressure exerted by the air motors 42 on the barking arms 35 is controlled or regulated from a remotely located or spaced control console 130 (FIG. 7) generally in a manner as shown in the above patent. Air is supplied to the control console 130 through a line 132 which is connected to an air supply tank 134 through a pressure regulator 136 and a filter 137. Air is supplied from the line 132 to a master control valve 140 having an operating solenoid 141 which may be actuated

either manually or by a device 142 which senses the absence of a log from the barker rotor 15. Pilot air is supplied from the valve 140 through a line 143 to the pilot actuators of a pair of pilot operated valves 145 and also to the pilot control of a pilot operated valve 146.

An air supply line 148 extends from the main supply line 132 to a solenoid actuated valve 150, and a lever actuated pressure regulating valve 152 is positioned in the line 148 for controlling the air pressure supplied through the valve 150 to a pair of relay exhaust valves 155 and to the pilot operated valves 145. A flexible line 158 connects each of the valves 145 to the passage 119 within the corresponding air shoe 115. Regulated pressure within the line 148 is also supplied to control a relay valve 160 positioned within a line 162 which connects the main air supply line 132 to the pilot operated valve 146.

A line 164 connects the valve 146 to the chamber 124 in back of the support diaphragm 120 for each of the air transfer shoes 115. The solenoid actuated valve 150 is also connected directly to the main air supply line 132 by a line 166, and a line 168 supplies air from the line 132 to a manually actuated quick exhaust valve 170. A line 172 extends from the valve 170 to the pilot control of a pilot actuated valve 175. The line 172 also supplies air through a pressure regulator 177 to the passage 123 behind the diaphragm which supports the air transfer shoe 115 aligned with the ports 74 within the air transfer plate 62. A line 178 extends from the main air supply tank 134 through a pressure regulator 136 and a filter 137 to the relay exhaust valves 155 and to the pilot operated valve 175. A line 179 extends from the valve 175 to the passage 119 for supplying air through the corresponding air transfer shoe 115 to the ports or holes 74 within the air transfer plate 62.

In operation, the lever actuated pressure control valve 152 is adjusted at the control console 130 according to the pressure desired within air motors 42, as for example, 40 psi. The master control valve 140 is actuated so that valves 145 open and lines 158 are pressurized to the selected pressure. When the lines 158 are pressurized, air is supplied through the corresponding air transfer shoes 115 and into the rotor chambers 50 and 60 until the air pressure within the chambers and within each of the air motors 42 arrives at the preselected pressure. As the rotor 15 is driven, and the holes 66 rotate past the adjacent air transfer shoes 115, the poppet valves 70 assure that the selected pressurized air is retained in the chambers 50 and 60 and the air motors 42.

Preferably, the chambers 50 and 60 and the air motors 42 are pressurized to the selected pressure when no log is in the rotor and the barking arms are therefore in their innermost positions. For example, the device 142 may be a microswitch operated by one of the arms 35 in its innermost position, or it may represent a switch responsive to a laser beam sensing the absence of a log from the rotor. As a log is fed into the rotor, the device 142 is caused to actuate the solenoid 141 to close the master control valve 140. This causes the pilot operated valves 145 and 146 to close, and the lines 158 and 164 exhaust so that the corresponding air transfer shoes 115 are released from the rotor plate 62.

If it is desired to increase momentarily the air pressure within the air motors 42 during a barking operation to provide a corresponding increase in the pressure exerted by the barking arms 35 on a log L as it is being fed through the rotor 15, the solenoid valves 140 and 150 are manually actuated so that the higher air pressure within the line 132 is supplied to the lines 158 through the bypass line 166. The buildup of air pressure within the rotor chambers 50 and 60 and the air motors 42 will continue as long as the solenoid valves are energized. When the solenoid valve 150 is deenergized, the air pressure within the rotor chambers 50 and 60, the air motors 42 and in the lines 158 will reduce to the normal operating pressure as selected by the regulating valve 152. That is, when the pressure in the lines 158 and in the rotor air chambers 50 and 60 exceeds the pressure in the line 148, air flows outwardly from the rotor chambers, backward through the lines 158 and exhausts through the relay exhaust valves 155.

In the event it is desired to release immediately the air pressure within the air motors 42 and the corresponding pressure exerted by the barking arms 35, as for example, to avoid jamming the rotor, the valve 170 at the control console 130 is actuated thereby pressurizing the line 172 to actuate the pilot valve 175 and to pressurize the corresponding diaphragm 120 to urge the corresponding air transfer shoe 115 into engagement with the air transfer plate 162. When the valve 175 is actuated, pressurized air within the line 176 flows through the line 179, the connected air transfer shoe 115, the holes 74 and through the passages 76 and 81 to the two air chambers 82 within the rotor housing 16.

The first puff of pressurized air within the rotor chambers 82 is effective to open the corresponding poppet valves 110 so that the chambers 82 are opened to the air pressure within the rotor chambers 50 and 60. When the chambers 82 are so pressurized, the diaphragm actuated exhaust valves 90 open thereby providing for immediate release or exhaust of the pressurized air within the rotor chambers 50 and 60 and within the air motors 42 connected to the chambers. When the control valve 170 is released, the pilot operated valve 175 closes, and the pressure urging the corresponding air transfer shoe 115 against the air transfer plate 62, is released. When the pilot operated valve 175 closes, the pressurized air within the rotor chambers 82 and the passages 81 exhaust through the exhaust passages or ports 81a.

If the selected air pressure in the air motors 42 and in the rotor chambers 50 and 60 is satisfactory for performing a barking operation on a particular log, the pressure exerted by the air transfer shoes 115 against the air transfer plate 62 on the rotor 15 may be released to minimize wear on the shoes and plate. This is accomplished simply by actuating the master control valve 140 to exhaust the air within the line for actuating the pilot operated valves 145 and 146. When the valve 146 closes, the air in the line 164 is exhausted through the valve 146.

From the drawings and the above description, it is apparent that a barking rotor and a control system constructed in accordance with the present invention, provides desirable features and advantages. For example, during the debarking of a log, the master control valve 140 is normally closed, and the air transfer shoes 115 are released from the air transfer plate 62. After the log is debarked and before the next log is fed into the rotor, and therefore when the arms 35 are innermost and the total volume of cylinders 42 is at a maximum, the devices 142 automatically actuates the solenoid 141 to open the valve 140 so that the air pressure within the rotor chambers 50 and 60 is readjusted, if necessary, to the pressure set by the regulating valve 152.

During a debarking operation, the pressure exerted by the barking arms 35 may be changed as desired by adjusting the lever actuated valve 152 and manually actuating the solenoid 141 to open the valve 140. When the air pressure in the lines 158 is less than the air pressure within the rotor chambers 50 and 60, the poppet valves 70 function to permit the air in the air motors 42 and rotor chambers 50 and 60 to flow out of the rotor through the lines 158 and be exhausted through the relay exhaust valves 155. That is, since the pressurized air within the rotor chamber 60 acts against both the diaphragm 72 and the valve member 60 of each poppet valve 70, the force which normally holds each valve member 68 against its corresponding seat 67, is equal to the air pressure within the chamber 60 multiplied by the difference in area between the valve member 68 and the valve seat 67. This force is relatively light so that only a relatively low pressure is required in the lines 158 to open the poppet valves 70 and thereby to permit the pressure in the rotor chambers 50 and 60 to balance with the pressure in the lines 158. In addition, an increase in the pressure exerted by the barking arms may be quickly accomplished by actuating the valve 150 so that the lines 158 are supplied with air directly from the main air supply line 132, bypassing the pressure regulator valve 152. If it is desired to maintain the increased pressure exerted by the barking arms, the regulating valve 152 is correspondingly adjusted.

Another important feature of the invention is provided by the quick exhaust control system. That is, simply by actuating the valve 170 at the main control console 130, a puff of air is introduced into the rotor chambers 82 thereby opening the poppet valves 110 which are balanced in the same manner as the valves 70. This permits the pressurized air in the rotor chamber 50 to actuate the large diaphragm operated exhaust valves 90 so that the air is immediately released or exhausted from the rotor chambers 50 and 60. As a result, the release of the pressurized air within the air motors 42 is immediately responsive to actuation of the control valve 170. This quick exhaust feature is especially desirable in that it enables the operator to prevent jamming of the barking arms, for example, by an irregular projection on a log.

As mentioned above, the control system of the invention also provides for releasing the pressure engagement of the air transfer shoes 115 against the air transfer plate 62 on the rotor 15 without releasing the pressurized air within the rotor chambers 50 and 60 and within the air motors 42. This feature is desirable during a barking operation to minimize wear on the air transfer shoes 115 and the plate 62 when it is not necessary to adjust the selected air pressure in the rotor chambers 50 and 60. Another feature of the invention is provided by the support of the rotor 15 by the large diameter anti-friction bearing 22. This support arrangement for the rotor 15 enables the rotor to withstand substantial impact loading or forces and significantly increases the service life of the rotor in comparison with the conventional support system including a plurality of rollers spaced around the periphery of the rotor.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. An improved log barker for scraping bark from logs of various sizes and shapes, comprising a frame, an annular rotor adapted to receive a log therethrough, means mounted on said frame and supporting said rotor for rotation, a plurality of barker arms pivotally mounted on said rotor for generally radial movement, a corresponding plurality of air motors mounted on said rotor and connected to bias said arms inwardly, wall means defining a circumferentially extending air chamber within said rotor and connected to said air motors, means for supplying pressurized air from a remote air source to said chamber while said rotor is rotating, remotely operable control means for regulating the pressure of air in said chamber and in said air motors while said rotor is rotating, exhaust valve means connected to said wall means defining said chamber and having a port effective to open said chamber directly to atmosphere, and remotely operable control means for opening said exhaust valve means to effect immediate release of pressurized air from said chamber and said air motors through said port.

2. A log barker as defined in claim 1 wherein said exhaust valve means comprise at least one diaphragm actuated exhaust valve, means defining a passage connecting said air chamber to said diaphragm valve, poppet valve means within said passage, and remotely operable control means for actuating said poppet valve means causing the pressurized air within said chamber to open said exhaust valve in response to opening of said poppet valve means.

3. A log barker as defined in claim 1 wherein said means for supplying air to said rotor chamber include at least one air transfer shoe slidably engaging said rotor, air actuated means for moving said shoe between a retracted position and an extended position engaging said rotor, an air supply line connected to said shoe, a pilot operated control valve in said supply line, and means for simultaneously supplying air to said air actuated means and said pilot operated valve.

4. A log barker as defined in claim 1 wherein said means for supplying air to said rotor chamber includes at least one air

transfer shoe, air actuated means for moving said shoe between a retracted position and an extended position engaging said rotor, and rotor, and valve means for retaining air at a selected pressure within said rotor when said air shoe is moved to said retracted position.

5. A log barker as defined in claim 1 wherein said means supporting said rotor for rotation comprises an annular bearing having an axis common to said rotor and positioned to receive the log therethrough.

6. A log barker as defined in claim 5 wherein said rotor includes an inner generally cylindrical hub portion, and an anti-friction said bearing having an inner race mounted on said hub portion and an outer race secured to said frame.

7. A log barker as defined in claim 1 wherein said means for supplying air to said rotor chamber include at least one air transfer shoe, and air actuated diaphragm means supporting said shoe for movement between a retracted position and an extended position engaging said shoe.

8. An improved log barker for scraping bark from logs of various sizes and shapes, comprising a frame, an annular rotor adapted to receive a log therethrough, means mounted on said frame and supporting said rotor for rotation, a plurality of barker arms pivotally mounted on said rotor for generally radial movement, a corresponding plurality of air motors mounted on said rotor and connected to bias said arms inwardly, means defining an air chamber within said rotor and connected to said air motors, means for supplying pressurized air from a remote air source to said chamber while said rotor is rotating, remotely operable control means for regulating the pressure of air in said chamber and in said air motors while said rotor is rotating, said rotor including an inner generally cylindrical hub portion, and said supporting means including an anti-friction bearing having an inner race mounted on said hub portion and an outer race secured to said frame.

9. A log barker as defined in claim 8 including exhaust valve means connected to said air chamber and effective to exhaust air directly from said chamber and said air motors, remotely operable control means for actuating said exhaust valve means, and said control means being effective to open said ex-

haust valve means in response to an air pulse supplied to said exhaust valve means.

10. An improved log barker for scraping bark from logs of various sizes and shapes, comprising a frame, an annular rotor adapted to receive a log therethrough, means mounted on said frame and supporting said rotor for rotation, a plurality of barker arms pivotally mounted on said rotor for generally radial movement, a corresponding plurality of air motors mounted on said rotor and connected to bias said arms inwardly, means defining an air chamber within said rotor and connected to said air motors, means for conducting pressurized air to and from said chamber while said rotor is rotating and including a plurality of normally closed poppet valves mounted on said rotor to retain the air within said chamber and said air motors, remotely operable control means for regulating the pressure of air in said conducting means and in said chamber and air motors while said rotor is rotating, and said poppet valves including means to cause opening of said valves in response to air pressure within said conducting means below the air pressure within said rotor chamber to provide for reducing the air pressure within said motors in response to actuation of said control means.

11. A log barker as defined in claim 10 wherein each said poppet valve includes a movable valve member connected to a diaphragm, and means for directing the air pressure within said chamber against said diaphragm to balance part of the air pressure acting on said valve member.

12. A log barker as defined in claim 10 wherein said means for conducting air to and from said rotor chamber include at least one air transfer shoe and air actuated means for moving said shoe between a retracted position and an extended position engaging said rotor, and said poppet valves are effective to retain a selected air pressure within said rotor when said air shoe is moved to said retracted position.

13. A log barker as defined in claim 12 including control means for automatically operating said air actuated means in response to the absence of a log from said rotor to move said shoe to said extended position and to reset the selected air pressure within said chamber.

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